RAILROAD GAZETTE

SATURDAY, JUNE 8, 1872.

Morgan's Combination Rail.

Mr. George C. Morgan, an engineer of Chicago, has invented a combination rail which is figured in the accompanying engravings, of which the inventor gives the following description:

"All railroad men know the trouble and perplexity broken and battered rails give, to say nothing of the many serious accidents happening from these causes alone, involving great loss of life and property. The reason why rails are thus battered and broken is plain enough and recognized by all, viz., weakness in the joints. Being deprived of all vertical strength at these points, the rails have a tendency to bend under a heavy weight, and bending gives an irregularity to the motion of a train which is alike destructive to rolling stock and track; besides, when the wheels of a heavily laden car pass over the end of a rail, deprived of vertical strength as it is, it must bend down below the level of the adjoining rail; consequently when the wheels reach the adjoining rail they *strike* it a severe blow. The result is easily summed up in the constant renewal of rails whose ends have been thus crushed and broken.

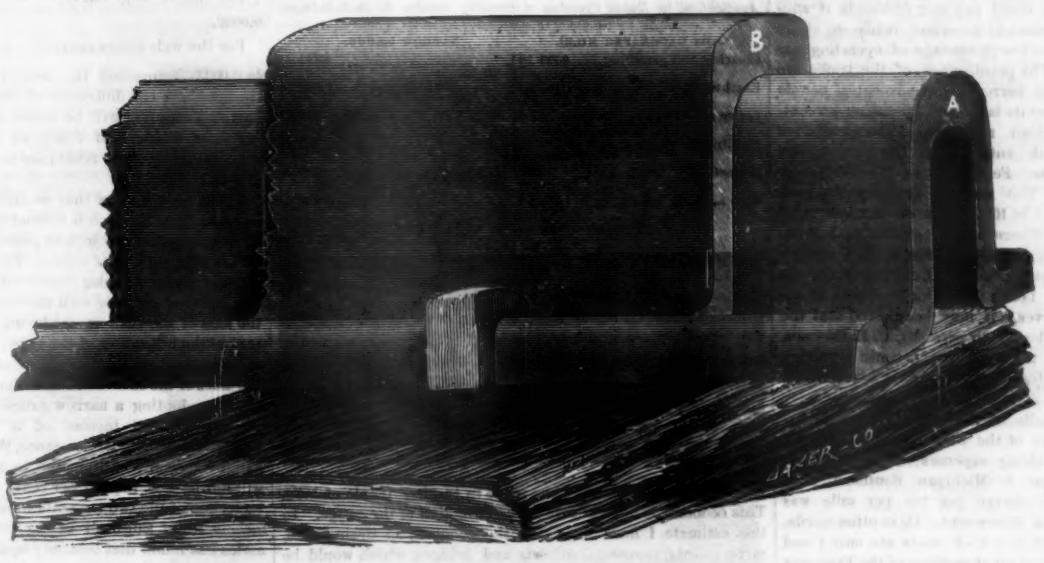
"To supply this want of vertical strength has been the constant effort of all inventors. The greatest success has been attained by binding the ends of the rails tightly together by means of splices and fish-plates bolted to them; but to do this it has been necessary to further weaken the rails by boring two holes through each end.

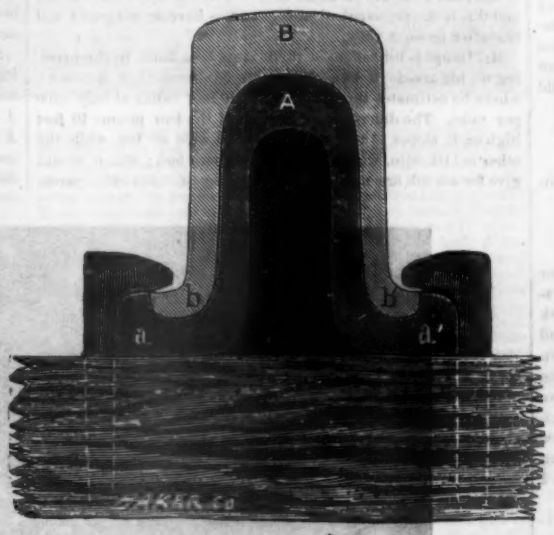
"This method is, undoubtedly, a vast improvement, but it has also had the effect of producing more broken rails. The statistics show that during the past year most of the rails broken, and particularly steel ones, are broken at the ends and in a slanting direction through both holes, so that on the whole none of these methods have given more than fair satisfaction.

"In Mr. Morgan's patent the rail is formed by a combination of two, or, if deemed advisable, three parts, as may be seen in the figure: A sub-rail, *A;* a cap-rail, *B;* and, if found useful, a soft lining to produce a closer fitting of the other two parts.

"The sub and cap-rails may be made both of iron, both of steel, or the cap-rail of steel and the sub-rail of iron. The last combinations Mr. Morgan considers the best, because the sub-rail being of wrought iron, gives a certain amount of elasticity; while the cap-rail being of steel, presents a hardened face to the rough usage of our heavy engines and cars.

"The object of the invention is to so make the rail as practically to do away with the joints. This is accomplished as follows: The sub-rail, *A*, is made in the shape of an inverted U, and the cap-rail, *B*, fits upon it closely and is supported by even pressure in all parts by the sub-rail; the ends *b* and b^1 pressing against the shoulders, *a* and a^1, of the flanges of the sub-rail, which also help to hold the cap-rail in place. The joints of the two parts of the rail are made at different points, thus rendering the whole continuous and making the track one solid piece from end to end, over which trains may pass undisturbed by a rattling of the rails."





—Benjamin Coultas has received a verdict for $6,000 damages in the Scott County (Ill.) Circuit Court against the Rockford, Rock Island & St. Louis Railroad Company, for injuries received on that road.

—The Chicago, Burlington & Quincy Railroad Company has presented $10,000 to the widow of Leo Carper, the Division Superintendent, who was killed by an accident near Burlington some time ago.

—The case of James Fisk, Jr., against the Union Pacific Railroad Company, the Credit Mobilier of America and others, for the accounting and transfer to the plaintiff of 20,000 shares of stock, has been revived, Mrs. Fisk being permitted by Judge Blatchford to come in on petition as plaintiff in the place of Mr. Fisk.

Contributions.

Narrow and Broad-Gauge Railroads.

To the Editor of the Railroad Gazette.

Of all the assertions of narrow-gauge men, the saving in construction consequent on the ability to employ sharper curves seems to be the most persistently reiterated. A writer who has lately occupied some space in your own and another journal, attempts to "shore up" his theory with letters, giving more or less in details estimates for the 4ft. 8½in. and 3ft. gauges, one of which ends with the extraordinary statement: "I think it hardly possible to build for broad gauge with 12 deg. curves!!!"* Now it is possible that there may be an engineer who does not know of curves of 12 deg. being in use on roads of the standard gauge, but the writer signs himself the Principal Assistant Engineer of a great trans-continental railroad, and says the production was submitted to the former Chief Engineer and published with his approval. Is it possible, after the analytical research on curves shown in the paper referred to, that the author and indorser are ignorant that a 25 deg. curve had been built by W. Milnor Roberts on the Don Pedro Railway, gauge 5ft. 3in., and that out of Canenovia, N. Y., a road is being regularly used for freight and passenger traffic with a 36 deg. curve?

Mr. T. E. Sickels, Chief Engineer and General Superintendent of the Union Pacific Railroad, has adopted the idea that the narrow gauge will admit of sharper curves than the standard gauge. I hope he will at some time favor the readers of the Gazette with a statement of his reasons.

The flange friction, which is the principal element of retardation, depends entirely on the length of the wheel-base, and not at all upon the gauge.† The resistance due to parallelism of axles is also independent of the gauge and dependent upon the length of wheel-base.‡ This being the case, the gauge cannot influence the traction, except in the slightly increased slip accruing from the greater length of the outer rail—which is only reduced one-third by decreasing the gauge from 4.7ft. to 3ft. And it may be seriously doubted whether the advantage to be derived from the decreased slip will counterbalance the disadvantages arising from the effect of a side wind on the increased length of train, or the increased tractive power necessary to draw such longer trains around curves. If it is claimed that smaller wheels (which, by the way, are possible on both gauges) will allow a decrease of the length of wheel-base, consideration should be taken of the fact that the resistance of rolling bodies varies *inversely* as the diameter of the wheels, and the axle friction is increased as the natural numbers when the velocities are increased as the squares of those numbers.

Mr. Sickels will have on the road between Denver and Golden City an opportunity to test the relative power requisite to move trains on each gauge; and careful experiments made there will be a valuable contribution to engineering knowledge. It is to be hoped that some narrow-gauge advocate will take an early opportunity to prove *how much* saving can be made in the traction of trains of the same weight on different gauges. It is possible that if a practical test be made, their theories in regard to traction on curves will be found to have as little foundation in fact as the already exploded theories in regard to the less dead weight of cars on the narrow-gauge.

With reference to the comparative costs of different lines between the same points, an instance occurred on the Union Pacific road which is pertinent. In October 1868, I was sent to locate a temporary line between Wahsatch and Castle Rocks, at the head of Echo Cañon. The late John R. Gilliss had charge of construction of both the permanent and temporary lines. The latter was 8 miles long, and the former 7.8 miles. Mr. Gilliss' estimate of work done on the temporary track was 69,300 of earth excavation, and 1,000 cubic yards of rock. On the permanent line, in round numbers, omitting culvert masonry, there were:

320,600	cubic yards	earth.	
8,470	"	"	loose rock in open cuts.
161,800	"	"	solid " " " "
12,410	"	"	rock in tunnel.
301,070	feet, b. m., of timber and lagging to line tunnel and support its roof.		
10,000	lbs. of iron bolts and washers in frames.		
446,670	ft. b. m. square timber.	}	in trestles.
9,600	lineal ft. round timber.		
16,200	" " brace poles.		

On the permanent line 90 feet per mile for grades and 5 deg. for curves were the maximum. On the temporary line the limit was 142½ feet per mile and 10 deg. curves. There were also two Ys. Both gauges were 4ft. 8½in.

The above are not loose guesses from rectangular lines, but measured quantities for work done and timber put in place. If we, for the purpose of comparison, consider a cubic yard of tunnel equal to four yards of open cutting, and take (according to Mr. Gilliss' estimate) 182,000 cubic yards as the amount necessary to fill the trestles, we have 995,500 cubic yards moved to build the one line, against 70,500 cubic yards to build the other line—between the same points—showing a saving of *ninety-three per cent.* The above shows what an immense saving in quantities a judicious adaptation of the grades and curves to the country can effect without recourse to a diminished gauge.

By the way—speaking of percentages and referring to the paragraph on "Bridges" in the same article—is not 33 per cent. a rather large saving in the cost of construction consequent upon a reduction of four feet in the length of the sway braces?

At the risk of being tiresome to your readers allow me to recapitulate the well-known facts that a ton of narrow-gauge engine will pull no more than a ton of standard-gauge engine; and that the carrying capacity per pound of dead weight for either freight or passengers increases with an increase of gauge—as shown in the measurements and weights given in your editorial article of July 8, 1871, page 168. In other words: *Neither the required driving weight on the rails nor the proportion of dead weight of cars is reduced by narrowing the gauge.* From which it follows, and is now generally conceded, there is no saving—consequent upon a narrowing of the gauge—to be made in the weight of rails. For the same reason there can be no saving made in the bearing surface of the cross-ties and the depth of ballast. And it may be doubted if—except for convenience in cases of derailment—it is necessary to make the embankments wider in one case than in the other.

The claim often made that a narrow gauge is essential for the use of light rolling stock is fallacious, for the "Brother Jonathan"—the first locomotive built in this country for the Mohawk & Hudson Railroad—was by the specifications to weigh but 2½ tons with wood, water and three men. Most persons can remember when from six to ten-ton engines were in use on strap rails, and quite lately the Rogers Locomotive Works built a 4ft,

* See *Van Nostrand's Engineering Magazine* for May, 1872, p. 518.

† Flange friction $= \frac{W F^{60} L}{10 R}$; in which W = weight, F = coefficient of friction, L = length of wheel-base, and R = radius of curve.

‡ This resistance $= \frac{W F L}{2 R}$; same notation as before.

8½in-gauge engine for Mr. W. W. Evans to send to South America, which weighed but 6,600 lbs. empty. Our street cars probably give as large a proportion of live to dead weight as can be secured on a narrower gauge.

Men who claim to be eminently practical continually assert that the cars and engines in use on the standard gauge are too heavy and the speed too great. This in the face of the fact that in practice all over the world engines have been increased in weight as the traffic has grown, and necessarily; for it is impossible with light trains at low speed to accommodate the business that offers on many single-track roads, and since to pull heavy trains at high speeds requires heavy engines, the weight of the rails must be proportionately increased. It is of course admitted that the injurious effects to both road and rolling stock increase in a more rapid proportion than the speed of the trains, but by increasing the rate of speed and the weight of trains remunerative traffic may be retained and the building of a second track be avoided for a number of years.

The Festiniog Railway is often cited as a successful example of narrow-gauge practice. It will be well, before yielding the point that the success of this road in paying dividends is due to its narrow gauge—or that it could pay *any* dividends if subjected to the same restrictions as American roads—to study its reports and see how the low percentage of operating expense has been obtained. The peculiarities of the traffic are never commented on by the narrow-gauge advocates, nor do they seem inclined to compare its tariff and operating percentage with those of American railroads. The traffic of this road consists almost entirely in carrying slates from slate quarries near Festiniog to Port Madoc, a distance of 13½ miles. The average gradient descending with the traffic, is about 1 in 100, except on the last mile, which is practically level. There are no grades against the traffic, so that the force of gravity does nearly all the work except hauling back the empty cars. And from the fact of "24 day-light and working hours being given for loading and unloading at quarries and wharves," it may be inferred that the company neither load nor unload their cars. Mr. C. E. Spooner, Engineer of the road, gives the operating expense as 44½ per cent., and the charge for slates per ton per mile 2.32d., which with gold at 110, is equal 5.41 cts. currency. The average freight receipts per ton per mile in the State of New York—according to the last report of the State Engineer—is 2.08 cts., and the average working expenses were 69.11 per cent. On the Lake Shore & Michigan Southern Railway, in 1871, the average charge per ton per mile was 1.39 cts. and operating expense 66 per cent. Or in other words, while the average charges of New York roads are only ⅓ and of the Lake Shore road only ¼ as great as those of the Festiniog Railway, the operating expense of the Festiniog is still ⅔ that of the New York roads and the Lake Shore: this, notwithstanding the facts that neither the Lake Shore nor any of the New York roads have the advantage of a continuous descending grade, and that in Great Britain labor, iron and fuel are greatly cheaper than here. *If the Festiniog Railway charged no more than the Lake Shore road it could not pay its running expenses.*

The exhibit of the narrow-gauge roads in Queensland is still more unfavorable. I fail to see anything in the financial statements of these roads to warrant capitalists in investing money in narrow-gauge roads—where there is any opportunity for competition. As the cost of transferring freight is 16 cents per ton (as returned by the Erie Railway Company), it will surely not pay at the rates obtained by the Lake Shore Company to build a branch line of a reduced gauge less than 11½ miles long.

NEW YORK, May 30, 1872. EDWARD P. NORTH.

Comparative Estimates for 3-feet and 4ft. 8 1-2in. Gauge Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In my last letter I have given the percentage of economy for clearing, earthwork, etc., of a narrow-gauge road comparatively with the cost of a wide-gauge one built with light stock and light rails, and intended to have the same traffic; and because I have not given the economy in dollars and laid down figures that you or anybody else might have found with the percentage I gave, you pretend in your comments that I have not made the estimate. This has been your way all through this discussion. Being short of arguments you write a few words of comment at the end of each of my letters, pretending that I have said what I have not, or that I have not said what I really have. Our readers will appreciate this.

The question at issue between us is this: You want to compare what does not exist on wide-gauge roads with what exists on narrow-gauge ones; while I contend that as long as the wide-gauge roads do not reform what they have, the only way to make a fair comparative estimate is to compare what they have with what the narrow-gauge roads have. It is utter folly and absurdity to compare what does not exist on one gauge with what exists on the other; and the fact that the wide-gauge advocates insist on such an unfair comparison proves that they are well aware of the inferiority of the wide-gauge roads as they exist now, and they want to compare them as they might be instead of as they are.

You and other advocates of the wide gauge have all the time feigned to ignore that the narrow-gauge companies are to be credited for two great improvements: the reform in the stock, rails and road-bed, and the reduction of the gauge. You have no right to refuse the credit of the reform of stock to the narrow-gauge companies as long as the wide-gauge companies obstinately refuse to make any. It won't do to refuse a man the credit of having succeeded in his business by saying that you might have done the same, and that on that account you ought to have as much credit as he. I will, however, for your satisfaction and that of other advocates of the wide gauge, make the estimate of what the wide-gauge roads might have with what the narrow-gauge roads really have; and I will prove that even in that case, supposing the roads in the condition where you want them to be, there is a considerable economy in favor of the narrow gauge—economy entirely due to the reduction of the gauge.

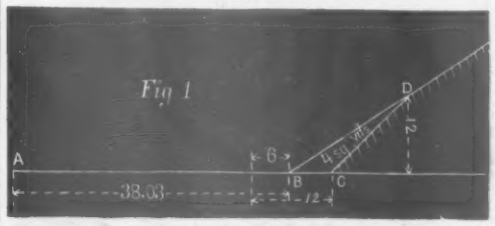
Comparative Estimate (for the satisfaction of the Editor of the RAILROAD GAZETTE *and other advocates of the wide gauge) of what does not exist now on wide gauge, but may exist at some future time, and what really exists on narrow gauge:*

WIDE GAUGE.	NARROW GAUGE.
Clearing and grubbing	2.84 per cent. in favor of narrow gauge.
Banks 11ft. 8½in. wide at top—and 6ft. high; slope, 1½ to 1.	Banks 10ft. wide at top, 6ft. high; slope, 1½ to 1.
Earthwork	8.21 per cent. less.
Loose and solid rocks and hauling.	8.21 per cent. less. (It was by mistake that, in my last letter, I estimated the economy in earthwork, rocks and hauling, at 5 per cent. instead of 8.21 per cent.)
Drain boxes	6 per cent. economy.
Crossings	14½ per cent.
Cattle guards	8 per cent.
Ballast	16.67 per cent.
Ties	7 per cent.
Trestle work, culverts and bridges.	There is an economy which I have not calculated and which I will not take into account.

Application to Roads Crossing a Country similar to that between Camp's Ferry and Tyler, Texas.

WIDE GAUGE (PER MILE).		NARROW GAUGE.
Clearing and grubbing	$352 16	$342 21
	Economy, $9 95	
Earthwork	7,107 60	6,523 57
	Economy, $584 03	
Loose rocks	979 43	899 01
	Economy, $80 41	
Hauling	2,137 93	1,962 41
	Economy, $175 52	
Ballast	730	600 00
	Economy, $120 00	
Ties	1,968 10	1,830 40
	Economy, $137 70	

Total economy per mile, $1,107 61



without speaking of the one made in turning points of hills. This economy is due entirely to the reduction of the gauge. In this estimate I have neglected the economy in drain boxes, cattle guards, crossings, culverts and bridges, which would be very appreciable. I am satisfied with the economy I have found on the other items.

According to Mr. Herman Haupt the economy in ballasting may reach $250 per mile, and the economy for the ties $200 per mile. This would put the economy per mile at $1,309.91. Supposing the economy to be only $1,100 per mile, the economy is $110,000 for a road of 100 miles in ordinary country. But the use of narrow gauge permits in rough country the use of sharp curves, allowing the location of the road so as to realize an enormous economy of excavation; and this is the principal advantage of the narrow gauge. I will hereafter prove it fully.

Mr. Haupt is mistaken, or there must be a fault in the printing of his article in *Van Nostrand's Magazine* (last number), where he estimates the economy for 10 feet banks at only $100 per mile. The difference of section of the two prisms 10 feet high each, slopes 1½ to 1 and one 10 feet wide at top, while the other is 11ft. 8½in. wide at top, is 17 square feet; which would give for a bank one mile long, an economy of 3,324 cubic yards, which at 35 cents a yard would cost $1,163.40—a great deal more, as can be seen, than $100.

Also, when he says that narrow-gauge roads as feeders for trunk lines of standard gauge involve transhipment at their termini, and separate equipment for their operation, which he considers as a drawback for narrow gauge, he overlooks the fact that a wide-gauge road, built with a light stock, would be exactly in the same position as regards other roads connecting with it and running a heavy stock, as it could not couple light cars running on 24in. wheels with the heavy cars running on 33in. wheels. Consequently it is unfair to attribute to the narrow gauge an inconvenience which is identically the same on a wide-gauge road running a light stock, and an inconvenience resulting merely from the reduced dimensions of the stock, and not from the reduction of the gauge.

I will speak now of the very great advantage offered by the narrow gauge for locating roads in rough countries, so that they can be built considerably cheaper than with a wide gauge, and in the case I give for example, there would be an economy of 97 per cent. Mr. T. E. Sickels, Chief Engineer of the Colorado Central, and Mr. J. P. Mersereau, Chief Engineer of the Denver & Rio Grande, have made estimates on their respective roads resulting from work done on narrow gauge, and compared to what it would have been on wide gauge. They found an economy of 78 per cent. I find one for the case I choose of 97 per cent., and that economy would be considerably greater if the slope of the hill was steeper, as in that case instead of a cut on the narrow gauge, on the wide gauge a tunnel would be necessary.

The formula employed in Europe to find out the resistance in the curves due to the sliding of the wheels is $R = f \times P \times \frac{a}{r}$; in which f is a coefficient determined by experiments and equal to 0.25; P = weight of wagon; a = half-width of track; and r = radius of curve. This formula proves that the resistance is proportional to the gauge and in inverse ratio to the radius of the curves.

Let us find with this formula what is the degree of a wide-gauge curve which would not offer more resistance than a 12 deg. curve, for example, laid for a narrow gauge.

For the 12 deg. curve, $r = 478.34$, and $a = 1.585$. $\frac{a}{r} = 0.0033$.

For the wide-gauge curve $a' = 2.435$, and $\frac{a'}{r'}$, must be equal to 0.0033. Supposing the weight of the wagon the same (although there is a difference of 80 lbs. per wagon in favor of narrow gauge), r' will be found equal to 737.87, which is the radius of a curve of 7 deg. 46′ 16″, and this would offer on wide gauge the same resistance as a 12 deg. curve on narrow gauge.

Let us suppose now that we are locating a railroad between a creek and a hill, which is frequently the case. Let us suppose that we come to a projecting point of the hill, and that the curvature of that point is so near this of a 12 deg. curve that we conclude to lay a 12 deg. curve with a narrow gauge, and let us suppose that we come with the tangent in such a manner that the axis of the road we are laying corresponds with the curvature of the hill at foot of the slope, and that the slope of the hill at this point is 1½ to 1 all round, and also that we want to have the sides of the excavation with slopes 1 to 1. I am going to prove that by adopting a narrow gauge and a 12 deg. curve to turn round that hill instead of a wide gauge and a 7 deg. 46′ 16″ curve of equal resistance, the economy in favor of narrow gauge—economy entirely due to the reduction of the gauge—will not be less than 97 per cent., supposing the angle I of intersection of the two tangents to be equal to 45 deg. Mr. T. E. Sickels, Chief Engineer of the Colorado Central, in his estimates has found that economy equal to 78 per cent. But in the case I am considering it is equal to 97 per cent.

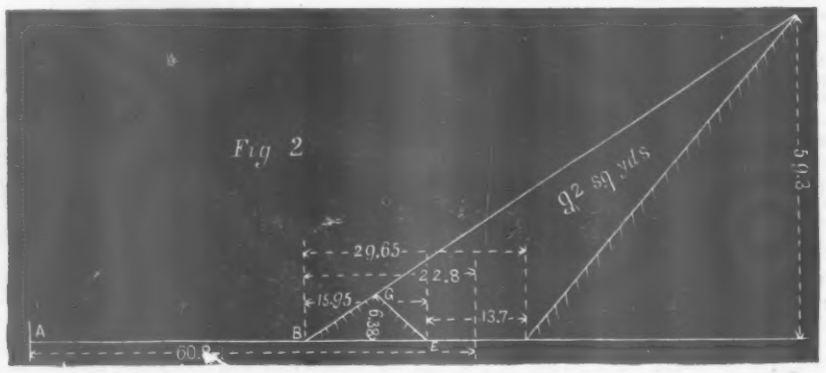
Let us calculate first the tangents $A\,M$ and $A\,N$ of the curves (fig. 3) by the formula $T = R$ tang. $\frac{1}{2}\,I$. In this case I = angle of intersection = 45 deg. Tang. $\frac{1}{2}\,I$ = tang. 22 deg. 30′ = 0.41421.

For the 12 deg. curve $R = 478.34$. Then tang. $A\,M = 198.13$

It will be also found that tang. $A\,N$ of the 7 deg. 46′ 16″ curve equals 305.63. The wide-gauge curve will, consequently, begin 107½ feet before the narrow-gauge curve.

Now for the 12 deg. curve the distance $A\,R$ from the point of intersection, A, of the two tangents to the center, R, of the curve equals 516.37 feet.

Subtracting from it the radius, 478.34, there is left 38.03 feet for the distance $A\,B$, or the shortest distance from the point of intersection to the hill, or to the 12 deg. curve. The distance $A\,R'$, for the 7 deg. 46′ 16″ is 798.7 feet, and the distance $A\,O$ from the intersection to the curve is 60.8 feet. Consequently the distance $B\,O$ between the two curves on the line of the centers of the curves will be 22.77 feet.



The length of the 12 deg. curve will be 375 feet, or 125 yards, and the length of the 7 deg. 46′ 16″ curve will be 579 feet, or 193 yards.

This being established, it will be seen that for building the road for the narrow-gauge curve I shall have only to take 6 feet at bottom of the hill, on the right of the axis of the road and all round, to make the road-bed. By giving the slope 1 to 1, the section of the cut all round the hill will be 4 square yards. This is illustrated by fig. 1.

Now it will be seen on fig. 2 that for making the road-bed of the wide-gauge equal to 13 in. 8½ ft., or 13.7 ft., the section of the cut all round the hill will be for the wide-gauge road equal to 92 square yards.

Having the respective lengths of the curves, we can find the total number of cubic yards for each excavation. The excavation necessary for the 12 deg. curve will amount to 500 cubic yards, while this for the 7 deg. 46′ 16″ curve will amount to 17,756 cubic yards—the difference in this case of 17,256 cubic yards, representing an economy of 97 per cent. in favor of narrow gauge.

If the cubic yard cost 35 cents, the cut for wide gauge will cost $6,214.60 cents, while that for the narrow gauge will cost only $175. This enormous economy, I contend, is entirely due to the reduction of the gauge, and is enough to settle the question in favor of the narrow gauge.

In looking at fig. 3, it will be seen that from *N* to *Q* in passing through the 12 deg. curve, the distance is 196.66 yards; while passing through the 7 deg. 46′ 16″ curve it is only 193 yards.

This shows that going up grades those 11 feet of difference in the length of the two roads could be turned to advantage in diminishing the grade on the narrow-gauge road—a very important advantage in curves. If the grade was 50 feet per mile, the difference of level between *N* and *Q* would be on the wide-gauge road 5½ feet. In supposing that we diminish the grade in the curve 0.05 feet per hundred feet per each degree of curvature, this would leave the grade at 0.60 per hundred feet or 31.68 feet per mile. On the narrow-gauge the grade could be diminished from the point *N*, and would be only 0.93 per hundred feet, instead of 0.95; and it could be reduced to 0.33 per hundred feet, or 17.42 feet a mile, in diminishing the grade according to the preceding rule of 0.05 feet per hundred feet, and for each degree of the curve.

I know that many persons who have not sufficient knowledge of engineering will wonder how a 12 deg. curve does not offer more resistance than a 7 deg. 46′ 16″ curve. I will answer them that it is because the two curves are on two different gauges, and also because, even for the same gauge, the amount of mechanical power absorbed in passing around a curve is altogether independent of the radius of the curve and depends only on the amount of the entire angular change in the direction of the line. When the curve has been run by "angles of deflection," its length in chains, multiplied by its angle of deflection equals the entire angular change. Thus a curve of 1 degree and 30 chains or 1,500 feet long, offers the same resistance as one of 3 degrees and 10 chains, or 500 feet long. Sharp curves are therefore not objectionable on the score of loss of power.

I have found with the formula above given that a 12 deg. curve on a narrow gauge does not offer more resistance to the trains than a 7 deg. 46′ curve on the wide gauge. I am going to make a special demonstration to facilitate our readers in the understanding of the case. I want to convert them to the narrow gauge, and I will not neglect anything which can help me.

The radius of a 1 deg. curve equals 5,729.65 feet. The length of the curve corresponding to a center angle of 1 deg. is 100 feet.

Now for a 4ft. 8½in. gauge the half of the width of the track from center to center of rails is equal to 2.435 feet. Consequently the length of the outer rail corresponding to a center angle of 1 deg., or to a length of 100 feet on the curve axis of the road will be 100.042 feet, and the corresponding length of the inner rail intercepted by the radius at each extremity of the outer rail of 100.042 will be 99.95 feet. The difference between the lengths of the two rails will be consequently 0.092 feet.

Now for the narrow gauge the length of the outer rail corresponding to a center angle of 1 deg. for a 1 deg. curve will be 100.027, and the corresponding length of the inner rail will be 99.97 feet. Difference between the two rails equals 0.057 feet for a center angle of 1 deg., or for a length of 100 feet on the curve on the axis of the road.

For a 12 deg. curve on a narrow gauge the difference of length between the two rails corresponding to a center angle of 12 deg. will be 0.684. Now if we divide 0.684 by 0.092, we will find the degree of the curve on wide gauge which would offer the same resistance for slipping friction as a 12 deg. curve offers. It is a 7 deg. $\frac{43}{100}$, or 7 deg. 25′ curve—very near what I have found with the formula I have given. We will find in the same way that a curve on a narrow gauge which would offer the same resistance as a curve of 10 deg. on a wide gauge would be a curve of 16 deg. 8′—a little sharper than the one of 15½ deg. indicated for that case by Mr. Herman Haupt.

I have made these estimates carefully and in the conditions you wanted them to be made. Instead of commenting the same as you have done you would better lay down some figures yourself, trying to prove that mine are wrong. Ideas do not get in our heads by surgical operation, as you suppose, but by a proper exercise of our brain and judgment. Remember, please, that I am responsible for all I write, but not for all that General G. P. Buell may have published in his report, and I think that you would better let him alone, as he is going to be very busy with the Indians in Texas, and won't have time to answer you.

I have made some corrections of the estimates I gave previously, but I have not retracted any of my arguments, as you wrongly and unfairly are trying to make people believe in your last comments. The Texas & Pacific Railroad, built with a wide gauge (4ft. 8½in.) and the ordinary stock, is going to cost about $72,000,000. I say and have proved that if the road was built with a narrow gauge and a light stock there would be saved a sum which I estimate from ten to fifteen millions of dollars, and an economy in hauling as great in proportion, supposing the road with its narrow gauge and light stock to have the same capacity as one with a wide gauge and a heavy stock, the speed of trains on both roads being the same.

CH. J. QUETIL,
Assistant Chief Engineer Texas & Pacific Railway.

Fig 3

A Great Tide-Water Terminal Station.

A few years ago, at the instance of Mr. Ashbel Welch, the President, the United Companies of New Jersey purchased a tract of 70 acres of land in Jersey City, having a frontage of about a quarter of a mile on the Hudson River, extending from South Second street on the south, north to South Seventh street, and extending inland nearly half a mile, being opposite to that part of the North River front of New York that lies between Vestry and Harrison streets. This was intended for the most complete terminal facilities possible, to aid in the receipt and delivery of freight to and from New York and ocean vessels. We copy the following description of the proposed work from the New York *Bulletin*:

THE HARSIMUS PROPERTY

comprised a tract originally of ninety acres, one-fourth of which, adjoining their long-dock property, had been leased by the Erie Company. When the remainder was bought by the New Jersey Company a division was effected with the Erie, which gave to the latter company seventy acres. To reach this property it will be necessary to construct a branch road, one and an eighth miles in length, diverging from the main line at a point near the Summit street bridge over Bergen cut, and having a grade of twenty feet to the mile. This road will extend through a cut until it reaches a point near the junction of Newark avenue and Paterson street, where a viaduct will begin over which the road will run, not descending to the street level until it reaches the property below Prospect street, and between South Third and South Fourth streets. The company has the right of way over nearly the entire route, its purchases covering a tract fronting on South Third street and extending south half the block toward Fourth street. This route is followed to Newark avenue, and it is proposed to use one-half of the space, that is, the rear half of the lots, for the viaduct, reserving the portion fronting on the street for narrow warehouses or other improvements, until such time as it may be necessary to widen the viaduct to accommodate more tracks than will at first be laid. The cost of the Harsimus property was about $1,000,000, and the purchases of right of way, thus far and yet to be made, amount to, in round numbers, $650,000. These purchases include some property purchased since the Pennsylvania road obtained control, although the greater part was purchased by the New Jersey company.

In preparing the Cove property for use, it is proposed to construct three ship canals or basins—the south basin 250 feet from the southerly line of the property (that is, from the middle of South Seventh street), 180 feet wide, extending inland from the bulkhead line 1,200 feet; the middle basin 300 feet from the southerly one, 180 feet wide, extending inland 1,500 feet: the northerly basin 320 feet from the middle one, 180 feet wide, half on the Pennsylvania Company's property and half on that of the Long Dock or Erie Company, extending inland 1,750 feet. Opposite the solid blocks between the basins will be piers extending from the bulk-head line 500 feet into the river, with tracks running down the middle, and a car ferry slip and bridge at the outer end for ferrying cars to New York. On each side of the track will be platforms and sheds for transhipments. On the solid blocks between the basins will be ten tracks, five to be devoted to each side of the basins, which they adjoin. The middle track will be kept open, the next two will be filled with cars loaded to go out or to be sent over to New York to unload; the fourth track will be kept open to enable the yard engines to reach the cars standing on the fifth track, which will adjoin the warehouses to be built upon the banks of the basins. A space 120 feet wide is left along each side of each basin for storehouses when wanted; and till then for sheds and spaces for piling up property awaiting distribution. Experience will hereafter determine how much space should be covered with storehouses, and how much left open. It is proposed to make the storehouses, elevators, etc., when built, in ranges 100 feet wide, along the sides of the basins, 15 feet from the face; each store 100 feet square; the lower floors being kept open from end to end of each range, for carts, as on the piers in this city; and used for spreading, inspecting, sorting, handling and temporarily piling goods; the floors above to be used for storing. The easterly part of the property, next South Seventh street is to be reserved for passenger business, to be used whenever it becomes necessary to establish another ferry. The southwestern corner is the proper place for the engine-house and machine shops. All the rest of the grounds will be wanted for standing room for trains, piling room, etc. Cars containing property carried for transporters having their own wharves in this city, or going to or from the company's wharves here, or market wharves, will be placed on or taken from car-floats at the ferry slip in the upper pier, towed across the river, and there unloaded and reloaded—in the same way that for some years past they have been ferried across the Delaware and loaded and unloaded at Philadelphia. The basins and piers, as proposed, will give, on a water front of only 1,300 feet, about two miles of docks, with a sufficient depth of water to accommodate vessels of any draft entering our harbor.

THE COST OF THE WORK,

aside from the money already expended in the purchase of the Harsimus property, and the right of way, will be in the neighborhood of $3,000,000, the cost of building the branch road being about $750,000. The plans as given here are such as have been designed by Mr. Welch, now Chief Engineer of the Pennsylvania Company's leased lines between Philadelphia and New-York, and although not formally accepted by President Thomson, it is probable that no notable changes will be made. Mr. Thomson is now in Europe, but previous to his departure he signified his approval of the well matured plans of the Chief Engineer, and his formal approval is expected at an early day, when work on the Cove property will be begun. Dredging has begun already, and the mud and rock taken from the bottom of the river, is being used to fill up the western end of the Cove. The Erie Company have informally concurred in the plans of Mr. Welch, and it is understood that a recent conference between this gentleman and General McClellan the latter signified his approval of the plans, and stated they would be accepted by his company when approved by the President of the Pennsylvania road. The plans, when carried out, will bring railroad, shipping, storage, and drayage facilities into contact as they are nowhere else in New York harbor, and will effect a great saving of expense to shippers and consignees in doing away with the necessity of ferrying and carting goods to stores in New York and Brooklyn and thence back to the North River piers for shipment elsewhere. The docks and basins, when built, will afford an admirable location for a warehouse company similar to those doing business in London and Liverpool; and it is not anticipating too much, perhaps, to look for a time in the near future, when business transactions here will be consummated on the certificates of warehouse companies, giving the result of their inspection of goods held by them to the order of the consignees.

THE SCRAP HEAP.

Wason Car Works.

The Wason Car-Manufacturing Company has recently let contracts for the construction of the buildings for its new shops at Chicopee, just above Springfield, Mass. It has completed a paint shop 500 by 75 feet, in which 32 passenger cars can be painted at once. The new works will have capacity for 800 men, twice as many as at present, and will be the largest in America.

New Car-Wheel Works.

The Washburn Works, Worcester, Mass., are to have car-wheel works in Hartford, Conn. Ground was broken for them lately on Suffield street, near the track of the Hartford & New Haven Railroad.

Prices of Rails in May.

Bigelow & Johnston, of No. 48 Pine street, New York, report the following prices current of rails for the month of May:

	Gold.	Currency.	Import, Tons.
New Rails.			
English	$73 @ 74		25,502
*American		$82½ @ 85	
Total import this month.			25,502
Import since January 1.			48,79
Total to date			69,500
Same time 1871			5[illegible],930
Old Rails.			
Double heads	$51½ @ 52		
T or Flange	$50 @ 51		
U or Bridge	Nominal.		6,587
Total import this month.			6,587
Import since January 1.			17,128
Total to date			23,715
Same time 1871			16,127

REMARKS.

"*New Rails.*—The firm feeling with which we commenced the month has gradually yielded to the pressure of a variety of circumstances combining to interfere with the steady current of business. Prominent among these have been the uncertainty regarding the Treaty of Washington and the unsettled state of the labor question. Of the two, the latter is probably the more serious; but it is generally conceded that capitalists in Europe are fighting shy of many of our new railroad schemes, ostensibly, because there has been no settlement of this interminable discussion over the Alabama question. We incline to think its influence on the iron market overrated, and that the present lull is due to natural causes, being the reaction from the feverish excitement and rapid advance in prices so notable in the early months of the year.

"Sales of foreign rails during May have been light, and we close with a nominal reduction of about $2 per ton.

"It is to be remarked, however, that the latest foreign advices report no diminution in the activity and strength of the market abroad. American rails have also suffered from the causes noted above, and are offered at lower and somewhat irregular prices. It is believed that our home mills have so far turned out fewer rails than last year.

"*Old Rails.*—A glance at our record of imports for the month will convince the firmest believer in high prices that they are certainly not due to scarcity, so far as this market is concerned.

"A very dull feeling has prevailed throughout, and considerable offerings by mills for re-sale unsettled prices and hastened a decline of $5 to $6 per ton from the highest point. There is now more steadiness, and though our quotations are to a certain extent nominal, in the absence of any general demand, yet they represent the figures for round lots, either afloat or to be shipped, and show little or no margin on latest London c. i. and f. quotations."

* These prices represent as nearly as possible the range, according to location of mill.

RAILROAD GAZETTE

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A. N. KELLOGG, *Proprietor.*
S. WRIGHT DUNNING AND M. N. FORNEY, *Editors.*
W. H. BOARDMAN, *Acting Publisher.*

CONTENTS.

Editorial Announcements.

Address.—*The* RAILROAD GAZETTE *will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.*

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

Articles.—*We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

Inventions.—*No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

EUROPEAN AND AMERICAN LOCOMOTIVES.

It has become a habit of American engineers and railroad managers quietly to assume a superiority in the designs and proportions of locomotives built on this side of the Atlantic. As there is probably no frame of mind more impervious to the truth or less capable of improvement than that of self satisfaction, it may perhaps be profitable to compare, as impartially as we can, the points wherein European practice differs most from ours. In another part of the GAZETTE, we give elaborate engravings and a description of a late design for a freight locomotive for the London, Brighton & South Coast Railway, for which we are indebted to *Engineering*. This engine, we think, is a fair example of the latest and most improved practice of English, at least, if not of Continental engineers. As will be observed from the specifications, it weighs when loaded or "road-worthy" which, by the way, is a very good expression) 38¼ tons, and has 1,414 square feet of heating surface, or 36¾ feet per ton of insistent weight on the wheels. A Mogul engine built at the Baldwin Locomotive Works, illustrated in the GAZETTE of February 17, and intended for similar traffic, had 26¼ tons of weight on the driving-wheels and 1,190 square feet of heating surface, or 44¼ feet per ton. About five tons of the weight of the Mogul engine was carried on a pair of leading "pony" truck wheels. If this had been placed upon the driving-wheels the heating surface would have borne about the same proportion to the adhesive weight as that in the English engine. Whether the efficiency of a locomotive is increased by simply placing more weight upon the driving-wheels will depend upon a variety of circumstances, which we will not consider now. Ordinarily, when all the weight of the locomotive is placed on the driving-wheels, the wheel-base must be inflexible, as is the case in the English engine, and to a limited extent in the Mogul locomotive under consideration. By placing a truck under the forward part of the engine, the adhesive weight is lessened, but the advantages of a flexible wheel-base and the better distribution of weight are in this country considered advantages of more importance than a mere increase of adhesion, and nine-tenths of existing practice and past experience might be quoted as testimony to confirm our statement. We are now speaking of engines for ordinary freight traffic, and not of those intended for special service on steep grades or other purposes. In nearly all cases, and especially with the inferior coal of the Western States, it is the steam-producing and not the steam-consuming capacity of locomotives that limits their power. It seems, therefore, very questionable whether it is desirable to sacrifice the flexibility which our American truck gives for the purpose of simply increasing the adhesion of the driving wheels, without at the same time adding to the steam generating capacity of the boiler. It seems quite probable that by the exercise of greater skill and the use of improved materials, it might be possible to increase the size and capacity of locomotive boilers without adding to their weight in the same proportion. The requirements of railroad traffic and the steady improvement in the methods of manufacture and quality of iron and steel, all point to this as the most promising and inviting field for improvement of locomotives.

It is not, however, in the general plan and proportions of engines alone that European practice differs from ours. In most of the details and arrangement of parts there are very noticeable and what begin to seem like characteristic variations. The engine under consideration, as will be seen, has inside cylinders and crank-axles—an arrangement now entirely obsolete here. We think we are quite within limits in saying that there are now from 500 to 1,000 locomotives under contract in this country, and that *not one of them* will have inside cylinders. It may, however, be well for us to consider whether we are quite right in this and our professional cousins altogether wrong. It certainly is somewhat curious that engineers in two countries speaking the same language and working to accomplish the same ends should, after forty years of experience and experiment, yet differ so widely, or at least have reached so little unanimity, in their practice. And yet it seems quite probable that the different conditions here and there may have caused this difference of practice. Here our rough roads made the flexible truck almost a necessity, and have been very destructive to crank-axles. With the better distribution of weight due to the use of a truck, we have found that the disturbing influence of outside cylinders was no very serious evil. The contention between those in favor of and those opposed to inside cylinders was very earnest, and almost rivaled in fierceness the "battle of the gauges," which has so recently been fought over again. With experience, however, it became apparent to those who took no part in the contest that outside cylinders had the best of it, or at least that locomotives thus equipped were less subject to failure and expense of repair, and thus the decision was quietly made in their favor. In Europe, however, the case is quite different. There the truck was not a necessity, and consequently the oscillation caused by outside cylinders was a greater evil than when a truck is used. The smooth roads there also lessened the liability to breakage of the crank axle. There can be no doubt that there are some advantages inherent in the use of inside cylinders. That a locomotive is less liable to lateral disturbance with inside than with outside cylinders, is certain; and that the conditions are somewhat changed now from what they were when the contest between them was waged in this country is also probable. For example, when a road is opened through a new section of country, it is most economical to carry all the traffic, including freight and passengers, on one train. As the business increases, the trains are divided, and passengers are carried on one and freight on another. As it developes still further, both passenger and freight trains are subdivided into fast and slow, a distinction which is made still more definite when a road is laid with a double track and when it consequently becomes possible for slow freight trains to be run and keep out of the way of the fast traffic. When a road doing a large business is operated with a single track, it is absolutely necessary that freight engines should be able to run fast in order to keep the line clear for other trains. As business becomes classified and a double track makes it possible to run trains so as to keep out of the way of each other, there is a demand for engines capable of hauling heavy trains at a slow speed. For such engines greater adhesion and relatively less boiler capacity is required, and with the improvement in roadbed the advantages of the truck are less important than when the road is rough and the speed required is greater. If now in order to secure more adhesion we abandon the use of the truck, and substitute instead a pair of leading wheels, as shown in the engraving, and use outside cylinders, it will be necessary either to place them entirely ahead of the circumference of the wheels, or else spread them to an impracticable distance apart. If we do the former, there will be a very great overhanging weight at the front end, which will require a corresponding weight behind to balance it. It is therefore necessary to place the trailing axles either quite ahead of the fire-box or else under it, and far enough forward to allow the fire-box to project enough behind to give the requisite overhang to balance the cylinder. To this there are two objections: First, there will be considerable overhanging weight at each end; second, the wheel base will be either very short and consequently unstable, or, if it is lengthened sufficiently, the boiler will be too long. As will be seen by our engraving, the inside cylinder arrangement obviates all these evils. It allows the cylinders to be brought up close to the leading axles, and consequently there is less overhang at the front end, and therefore less is required behind, and therefore the wheel-base may be made of the requisite length without increasing too much that of the boiler. The inclination of the cylinders is, of course, required in order that the guides may clear the front axle. It will be seen, therefore, that the use of inside cylinders enables us to adopt certain advantageous proportions in the construction of locomotives which are quite impracticable with outside cylinders.

If the question were put to American locomotive engineers, What is the chief objection to the use of inside cylinders? the answer of four out of five would, we believe, be, that it is the crank axle. Whether this objection has not now to a very great extent become obsolete, owing to the use of better and more powerful steam hammers and other machinery, and the adoption and perfection of new and improved processes of making steel and wrought iron, is also worth consideration. Only a few years ago engineers fixed the maximum load which should be carried on a driving wheel of a locomotive at 10,000 lbs. per wheel. The manufacture and use of steel tires and rails now makes nearly double that weight possible.

It is not our purpose now to present any positive conclusions, but to suggest considerations for a revision at least of the conclusion which we have quite decidedly come to in this country.

A careful examination of the details shown in the engraving which we publish will show very many variations from our practice, which it will be at least interesting to study. Take the plate frame as an example. But one master mechanic in this country that we know of Mr. Eddy, of the Boston & Albany road is using this plan of frame. By using it and the underhung springs it is possible to widen the firebox from five to six inches more than with solid-bar frames of the ordinary width. This increases the grate area from fifteen to eighteen per cent, and leaves the sides of the firebox almost straight, so that the circulation is more free than when the lower part is contracted. The advantages of our method of construction should be very decided to compensate for so great a loss of grate surface as fifteen per cent. Another advantage claimed for the plate frame is that the bolt holes in it required to hold other parts of the machinery do not cut away nearly so much material as is done when a solid square bar is used.

The steeply inclined grate is also a feature in the engine under consideration which is never used in this country. This gives the advantage, when the trailing axle is located so far back or when the fire-box is very long, that the inclination of the back end of the grates gives abundant room for the axle under it, without any danger of its being overheated by the fire. It also makes it easier to keep up the "live" fire at the front end of the grate, and the combustion is thus improved, as the raw coal must thus either pass over the bright fire or else when a brick arch is used the products of combustion pass over the fresh coal at the back end.

It is very doubtful, however, whether the plan of arranging the cylinders—which are cast together—valves and steam-chests will meet with approval in this country. Our own plan seems so much more simple, and makes the cylinders so much more accessible, that few could be induced to change it for that shown in the engraving. The pistons, it will be seen, are made without a follower-plate, and have simply two rings sprung into a groove to keep them tight. The pistons are simply a disk of cast iron, but are made of a "dished" form, so that the stuffing-box can be placed as far into the cylinder as possible, which allows the latter to be brought up closer to the front axle. The cylinder-heads are made to conform in shape to that of the piston.

The arrangement of the blast pipe, too, extending as it does very high up into the smoke-box, is also quite different from our practice. The straight smoke-stack, without any spark-arrester, is also impracticable on our roads at present, as it would set the whole country along the line of the road on fire at certain seasons.

The side buffers are not to our knowledge used in this country, and probably could not be on our rough roads and sharp curves.

From the specifications it will be seen that the diameter of the largest boiler plate is 54 inches, and its thickness 9-16 inches. "The longitudinal seams are all

double-riveted with butt-strips inside and out, *the latter being countersunk* to enable the rivets to fill the holes well up. * * * all the holes in the boilers *are drilled*, and all the edges of the plates planed." It is quite safe to say that there is no work done here with so much care as these specifications stipulate. Conceive of the surprise of one of our locomotive building establishments if a master mechanic should specify that holes should all be drilled and countersunk so that the rivets would fill the holes. It is very doubtful whether it would now be possible to have such an order executed in this country, simply because—and this is not pleasant for us to admit—we do not do so good boiler work here as English builders are required to furnish.

Other portions of this engine will be worth careful examination. The cab for the runner will not, we think, bear favorable comparison with those made here. The use of the donkey-pump should also be approved, but whether the communication from the exhaust-pipe to the tender will pay for itself seems exceedingly doubtful. Altogether, this design and the specifications will repay a very careful study; but it is doubtful whether, if it is done impartially and without prejudice, it will be altogether flattering to our national professional vanity.

THE CANADA CANALS AND THE TRANSPORTATION OF GRAIN.

The Canada canals are likely to be so improved very soon as to offer an admirable route for grain shipped from the Northwest to Europe and parts of New England, and, indeed, to all parts of the country which may be supplied more readily from Oswego, Montreal or Quebec, than from Buffalo. The administration of the Dominion has presented to the Parliament for its sanction a bill appropriating $4,000,000 for the improvement of its canals, and this amount, it is said, will put the Welland Canal, between Lake Erie and Ontario, and the St. Lawrence canals in such condition that vessels of 1,000 tons burden and drawing 10 feet of water, capable of carrying 40,000 bushels of grain, may sail from Chicago, Milwaukee, Duluth or Toledo through to Montreal—or to Liverpool, for that matter—without difficulty or delay. The capacity of the Welland Canal at present is for vessels of 400 tons, carrying 18,000 bushels of grain.

The proposed enlargement, which will probably be made, as the Dominion can easily secure the necessary capital, the present administration has made it one of its declared policies, and the results in the advancement of the commerce of the Dominion are most promising, will virtually form an extension of lake navigation to tide-water; for the vessels on the Lakes—at least those engaged in the grain trade—rarely exceed in dimensions the capacity of the enlarged canals. Since, however, tugs will be required through the canals and for much of the distance on the St. Lawrence for all sailing vessels, when we speak of lake navigation being extended to Montreal, we must understand that this opening of the channel is not equivalent to an absolute removal of all barriers; for while the great expense of transhipment will be eliminated, there will remain tolls for all vessels and towage for all sail vessels, which will make the cost for the canal and river transit considerably more than for the open lakes. However, the cost will be so much less than for transportation in cars or canal-boats that these expenses will probably have little weight in a comparison.

But, granted that the proposed improvements will virtually open lake navigation, or establish transportation at lake rates, or very nearly, to Oswego, Ogdensburg and Montreal, what will be the effect? There are those who believe that it will occasion a revolution in the grain trade; that the vast tonnage now shipped from the western ports to Buffalo will pass down the St. Lawrence, and either cross the ocean in the same bottoms or be transhipped at Montreal. But these people are those who have not yet learned (and seem very slow to learn) that the great market for the grain of the Northwest is not in Europe, but in the Northeastern United States. A line drawn from Cleveland through Pittsburgh to Baltimore will indicate roughly the line between what we may call the grain-consuming and the grain-producing sections of the country—the latter producing more than it consumes, the former consuming more than it produces. Now of the grain shipped from the West, usually not one-eighth crosses the ocean. Nearly all of the other seven-eighths finds its market in the district we have called "grain-consuming." It is evident, therefore, that whatever may be the effect of ship canals around Niagara and down the St. Lawrence, they cannot turn the larger portion of the present grain shipments of the West to the Atlantic by way of Montreal. That foreign shipments will take that route to a very great extent seems extremely probable; but these shipments being comparatively not important, we will do well to consider first the effect of these proposed improvements on the direction of shipments for domestic consumption.

New York being the great depot of supplies of the country, grain shipments are made from it to a considerable extent in every direction, not infrequently directly back on the route by which it arrived; but aside from this, the country supplied with grain by way of Buffalo or Suspension Bridge is chiefly New York and New England; Pennsylvania and the small district south of it getting most of its supplies otherwise or elsewhere. How, now, can this territory be best supplied when the vessels which take in grain from the Chicago, Milwaukee and Duluth elevators may discharge it at Oswego, Ogdensburg and Montreal, as well as at Buffalo?

In the first place it is evident that that part of New York west of the Oswego Canal—a thriving and populous district—except perhaps a few ports on Lake Ontario, will find the old route still the best. The rest of the State supplied by the canal, including New York itself, will have a somewhat cheaper route by way of Oswego, and the probability is that much of the Buffalo traffic will be transferred to Oswego. East of New York we have the great consuming districts of New England, to which the shipments are the greater because the home production of grain is trifling. Part of this district, and a very populous part, is easily supplied from New York; but the larger part, if not the most populous, is more easily accessible from Oswego, Ogdensburg and other St. Lawrence ports. Montreal, Ogdensburg and Oswego are already closely connected with the railroads of New England, and by the time the canals are improved, considerable additions and improvements, now in progress, will doubtless be made in these connections. These railroads, of course, will be quick to take advantage of their position, and they may be expected to carry a large share of the grain consumed in New England.

As regards exportations of grain, we would not underestimate the importance of reduced cost of transportation. Of course our exports are now absolutely large and exceedingly important, and small only in comparison to our production. But in this there are magnificent possibilities. We may export ten, yes twenty times as much as we do now, *if we can sell cheap enough;* and the opening of the way for lake vessels to Montreal or Liverpool promises a large reduction in the cost of transportation and a considerable reduction in the cost of our grain in the European markets. A stimulation of exports, a demand for a large product *in addition* to our present foreign export and home consumption is what we may most hope for from these canals. The increased production caused thereby might largely increase the traffic of the railroads of the country, and especially of Western roads.

The effect of such an improvement may be very great in the transportation of grain through from the farmer's shipping station in the West to the consumer's station in the East, the development of which and its growth and promise we have frequently noticed. It is a business which has become important within a few years and has grown steadily and rapidly, the proportion of rail shipments to lake shipments increasing constantly. It has not been to the railroads a very profitable business, as it could be done only at the very lowest rates, in order to meet the lake and canal competition; but it has been a promising traffic because of its immense bulk. There is scarcely any limit to the amount of this freight obtainable in the West for transportation eastward, and it has been looked upon to supply traffic to that great ideal railroad to be worked to its full capacity, which shall have two tracks for freight and trains night and day as near together as they can be run with safety. With a very small profit per car load magnificent net earnings might be made by the railroads if they could secure the transportation of most of the grain now shipped on the lakes.

This traffic is likely to be unfavorably affected by such an improvement as will reduce the cost of carriage by water. While the railroads may compete with some success in carrying grain from Chicago to New York and New England when lake navigation extends only as far east as Buffalo, the competition may be almost impossible when navigation is virtually extended to Oswego, Ogdensburg and Montreal.

That the canal improvement will be on the whole disadvantageous to the railroad lines from Lake Michigan to the East, even should it greatly decrease their grain traffic, is, however, more than questionable. The impulse given to the growth of the Northwest by a considerable reduction in the cost of exporting its grain would do much to increase a much more profitable, if less bulky, traffic than that in grain, and especially to increase the traffic westward, which is now so much less than that in the opposite direction.

There are two classes of railroads, however, which have very much to hope from the proposed improvement: first and chiefly those extending from the upper lakes westward, whose traffic of all kinds increases with the growth and prosperity of the country through which they run, and that further west, whose traffic they carry; and, second, those from the St. Lawrence and lower Ontario ports eastward and southward, which will carry to the consumers the grain arriving at those ports.

We have considered this subject solely with reference to its effect on the railroads, and chiefly to their grain traffic only. It hardly needs be said that the Western lake cities, and Chicago especially, may find in it magnificent opportunities for the cultivation of direct importations as well as exportations. If the grain exports are immensely increased, as is possible, and the exports are chiefly trans-shipped at Montreal, as some believe, the latter city may become the Liverpool to New York's London; but if the vessels loaded at Chicago cross the ocean with their cargoes, then that city must become the great importing city for the interior, and no American city has so promising a future.

Mr. Quetil's Estimates.

In a letter published in this number of the GAZETTE, Mr. Ch. J. Quetil has made some estimates for the cost of narrow and standard-gauge railroads, which we may review hereafter, only saying here that his figures only show a saving of a very small percentage, compared with the claims of most advocates of the narrow gauge, and that we must take exception to some, at least, of his assumptions as to the comparative requirements of roads of the two gauges.

His estimate for the comparative cost in a certain peculiar location would be very much more valuable if it was not based on a grand fallacy. Mr. Quetil assumes that the only objection to sharp curves is the friction caused by the slipping of the wheels on the outer rail. He neglects altogether the danger of derailment in running around such curves at considerable speed (which is greater with a narrow gauge), and the flange friction, which latter is independent of the gauge and is quite as great as, if not greater than, the resistance caused by slipping on the outer rail, as we have shown heretofore.

Mr. Quetil will have to revise his location before his estimates for construction around his chosen hillside will be worth anything. The difference of radius of curves of the two gauges presenting the same resistance will not be nearly so great as he has given it.

The Wear of Rails.

The wear of rails is a subject of chronic complaint on the part of engineers, managers and presidents, which latter often lament that large sums go for renewals which they had hoped to put in shareholders' pockets. Very frequently, too, we hear railroad officers complain that the iron rails they are supplied with now do not wear nearly so well as did those put in the track ten, fifteen or twenty years ago, "when our road was new." Of course these men know that increased train service must occasion increased wear, but we doubt if they always give sufficient weight to the growth of traffic on their lines, to the increase in the speed of trains which has been quite general, and especially to the great increase in the weight of locomotives. A change from locomotives weighing sixteen or eighteen tons, and never exceeding fifteen or twenty miles an hour with passenger trains, to thirty-ton locomotives drawing cars heavier than the old engines thirty or forty miles an hour, must be expected to increase very seriously the destruction of the rails of a road.

On those railroads where there are now few trains (though, perhaps, heavy engines) and a slow maximum speed, we think there will be few complaints of rapid wear of rails, except in those cases—of, which, alas! there are too many—in which the sole specification given to the purchasing agent was that the iron should be the cheapest to be obtained. We are supplied with an illustration by the "rail statements" made in the last report of the Mobile & Ohio Railroad by its accomplished Chief Engineer, Mr. L. J. Fleming. This statement gives in tabular form, concerning the rails of each maker, the time of laying in track, weight, length laid, length worn out and removed, length still in track, number and aggregate length of laminated rails now in track, average annual depreciation, and the number on hand, both good and worn out, with the fastenings used. From this we learn that of 33 miles of rails (60 lbs. per yard) laid in 1852, 11 miles remain, the average annual depreciation having been, including those now in track, 4.6 per cent., making the average life of these rails a little less than twenty-two years. Of 59¼ miles of Ebbw Vale rails laid in 1854 (68 pounds per yard), 47 miles are still in track, and their average annual depreciation has been 1.9 per cent., which indicates an average life of more than 51 years! Of 4¼ miles of siding rails weighing 48 lbs. per yard, laid in 1860, the average depreciation has been 7.6 per cent. per year, showing a life of about thirteen years. Coming down to later years, we have Belgian rails, 60 lbs. per yard, laid in 1866, whose annual depreciation has been 3.2 per cent.; Crawshay Company rails, 68 lbs. per yard, laid the same year, depreciating 2.9 per cent. yearly; New Albany rails, 63½ lbs. per yard, laid in 1869, whose wear is 1-5 of 1 per cent. per year; small rails, 48 lbs. per yard, 5.1 per cent. per year; and the only really bad showing is of some patched rails, laid in 1869, which have disappeared at the rate of 42.3 per cent. per year. Most of the rails used on this road are very heavy (for an American road),

about 300 of the 421 miles accounted for in one of the divisions weighing 68 lbs per yard.

The worst of these rails has an average life of thirteen years, and the average must be something like twenty or twenty-five years. Evidently roads like this—including most in the South—are not likely to be large buyers of steel rails. Iron serves them very well.

THE MOBILE & OHIO RAILROAD, an abstract of whose annual report we publish, is an example of a road such as is common enough in the South, but the possibility of which seems to be generally ignored elsewhere; that is, it is a railroad through a country with a thin population and a light traffic, to which country it is suited by its very low cost and the cheapnes of its operation. That is, the country not being able to pay for frequent trains and high speeds, the trains run are few in number and their speed moderate. There is but one through passenger train, whose average speed is about seventeen miles per hour. The capital account is only $20,775 per mile. This is a very practical cutting of the coat according to the cloth, and the result is a country is served by a railroad which otherwise would be—most of it—quite isolated from the rest of the world.

The country on the line of this road is probably quite as productive and populous as the average of the South west of Georgia, some of it being very poor, and some unusually fertile; but altogether the traffic of the road confirms what we have said as to the comparative lightness of the traffic in the South. The Mobile & Ohio, for most of its length, may be said to be without rivals; it is two or three days' journey to the nearest road on the west for two-thirds of its length; there is scarcely any accessible railroad—or there has been none until very lately—on the east for six-sevenths of its length, and only four lines cross it from Mobile to Columbus. The area of country which depends upon it as an outlet is remarkably large. Moreover, the road has been long in operation and its traffic is established. Yet we see the earnings per mile for 1871 (the largest in the history of the road) were only $3,086. We say *only*, bearing in mind the earnings of railroads north of the Ohio; but in fact a comparison is hardly proper. The latter country (contrary to a pretty widespread impression) is very much the most productive and more of it is cultivable, and—what we would especially call attention to—its products per acre are much more bulky and weighty. One might say that the Illinois Central, easily conceived of as an extension of the Mobile & Ohio to Chicago, earns about twice as much per mile with hardly one-third of the area per mile of road, the country on its line being gridironed with railroads; but if a comparison be made it should be made with roads in the same section, and in such a comparison the Mobile & Ohio will stand well.

THE WESTINGHOUSE BRAKE, which has met with so much favor in this country, being used on all or part of the passenger trains of no less than eighty-five railroads, which have an aggregate length of nearly 20,000 miles, and having been applied to 1,200 locomotives and 4,000 cars, has now found its way to England. The Caledonian and the London & Northwestern railroads are trying it, as we learn from *Engineering*, which in its issue of May 24 gives elaborate engravings of its application to a locomotive and coach of the Caledonian Railway. The peculiarities of English rolling stock make necessary considerable modifications in the details of the brake, and Mr. Westinghouse has designed a train-signaling apparatus to be used in connection with it, though it is by no means a necessary adjunct.

These modifications and the greater conservatism of English railroad managers make the introduction of the brake in that country no easy task, and Mr. Westinghouse's success in securing a trial for it on two of the leading lines is itself quite a victory.

The Civil Engineers' Convention.

[EDITORIAL CORRESPONDENCE.]

NIAGARA FALLS, June 2, 1872.

That the science of engineering is gradually beginning to crystallize into a more clearly defined and distinctly recognized profession in this country is growing more obvious every year. One of the chief indications of it is the banding together of those engaged in kindred branches of business or practice. As readers of the GAZETTE have observed from our published notices, the civil engineers, mining engineers, railroad superintendents, master mechanics and car builders, all either have held or purpose holding conventions this spring. Considering the fact that successful engineering requires an extensive and accurate knowledge of science, close and careful observation, skillful deduction and logical reasoning, and—more than all—that blunders and miscalculations are speedily followed by failure and disaster, it would seem that engineering should rank quite as high, as a learned profession, as law, medicine or war.

There are now two entirely distinct associations of civil engineers in this country, the one the American Society of Civil Engineers, whose headquarters are in New York, its membership composed largely of the older engineers. This might not inaptly be termed the "static" society. The other is the Civil Engineers' Club of the Northwest, with headquarters in Chicago; its members consisting of younger men, who are nearly all more actively engaged in the practice of their profession, and therefore it might be called the "dynamic" society. At the last annual meeting it was proposed that this year the older men of New York should meet the younger ones of Chicago, and it was hoped that thus the interests of each would be promoted.

With this object in view the arrangements were made to hold the meeting in Chicago on the 5th of June, and an excursion—of which these notes are intended to furnish some memoranda—was organized to leave New York by the Erie Railway on Saturday morning, June 1.

To the hospitality of General Alexander S. Diven, the Vice-President of the Erie Company, the party was indebted for the most elegant accommodations which the Erie, or any other road, could supply. A drawing-room and a restaurant car, and skillful attendants, were placed at the disposal of the excursionists, and a lunch was provided which, to describe it professionally, was of the most admirable design; and all were agreed that the hospitality of this company and its officers was as broad as the gauge of their road.

The party left New York at 9:30 a. m. on Saturday. It consisted of the Hon. Wm. J. McAlpine, of New York; James B. Francis, of Lowell; James O. Morse, G. Leverich, Stephen Chester, Wm. Arthur, Ira Spaulding, Alfred P. Boller and Thomas F. Rowland, of New York; Col. James H. Armington, of Providence; A. D. Briggs, of Springfield, Mass.; Gen. Theodore E. Ellis, of Hartford; Geo. H. Norman, of Newport; Clark Fisher, of Trenton; Edward P. North, F. Collingwood and Richard D. Dodge, of New York; S. S. Chase, of Holyoke, Mass.; Wm. S. Barber, of Boston; Martin Coryel, of Wilkesbarre, Pa.; James Archbald, of Binghamton, and others. At Elmira, General Diven, to whom the society was indebted for the liberal hospitality with which they were transported, joined his guests and exchanged greetings with many of his old friends, some of whom had been professional companions with him years ago.

Time and the train flew very rapidly. Engineering discussions were the order of the day, and the scraps of information which were exchanged, if recorded, would make a much more interesting and valuable contribution to the GAZETTE than what is here given. These discussions took a wide range. They commenced at foundations, and we heard comments on building stone, cements, sinking piers, proportions of bridges, preservation of iron, locomotives, narrow-gauge, down to Horace Greeley and his capacity and prospects of election. It was decidedly dangerous to venture an assertion without a demonstration ready to sustain it, as the most awkward and embarassing questions were asked, and had to be answered, or else retreat in confusion was the only alternative.

The plan adopted by the party was to reach Niagara at 12:40 on Sunday morning, and spend Sunday at the Cataract House. Unfortunately, however, the train was detained about two hours by a blockade of freight at Hornellsville. Consequently the connection at Buffalo was missed, and at 3 a. m. there seemed every prospect of a blockade of engineers. After diligent and earnest inquiry of inscrutable and sleepy employees, a tall, self-possessed individual announced his intention of calling at the Assistant Superintendent's house, and interviewing him with regard to the fate of the Civil Engineers' Society. During his absence the wildest and most heart-rending jokes were perpetrated by grave and serious engineers. The weird light of day-break, and the semi-comatose condition of the sleepy members gave a fantastic and grotesque element to the fun which was perpetrated, which made it seem a little doubtful whether it was tragedy or comedy which was enacted. An active and apparently energetic individual with a very blue neck-tie, however, finally announced that a special engine would be provided to take the party to Niagara. A further delay of a half hour and a fast run finally landed the representatives of the American Society of Civil Engineers at the Cataract House at 5 a. m.

At the present writing, they are scattered about from Goat Island to the lower suspension bridge, some of them probably calculating the number of foot pounds of power developed or lost by the water of the falls, or speculating possibly on the ultimate result of the actinic influence of the tremulous green rays of light reflected from the water on the wire cables of the new suspension bridge. In such soothing reflections they are ever wont to seek recreation and diversion.

Speaking soberly, however, thus far the excursion has been a success. Members have become better acquainted, and by personal interview have learned more of each other and their profession and practice. It was a cause of universal regret that the President, Mr. Allen, could not be with the party. Business engagements, however, prevented. All here will, we know, join in drinking his heath, and wishing him long life and prosperity.

NEW PUBLICATIONS.

The Metric System of Weights and Measures. By Frederick A. P. Barnard, S. T. D., LL.D.

This comprises an address delivered by President Barnard before the Convention of the University of the State of New York at Albany, August 1, 1871. It is impossible within the space we can afford to give a fair digest of the contents of the work and its voluminous appendices. It opens with a comprehensive sketch of the origin of the metric system as established at Paris, in 1799, by representatives of the Governments of France, Holland, Denmark, Sweden, Switzerland, Spain, Savoy, and two or three other European States of minor importance. These adopted as the unit of length the *metre*, equal to a trifle more than 39.37 inches; and, taking this for a starting point, the *are*, which is the unit of measures of surface and is the square of ten metres; the *litre*, which is the unit of capacity and the cube of one-tenth of a metre; the *stere*, which is the unit of measures of solidity and the cube of one metre, and the *gramme*, which is the unit of measures of weight and is the weight of that quantity of distilled water at its maximum density, which fills the cube of the hundredth part of a metre. Each of these units "has its decimal multiples and submultiples, that is, weights and measures ten times larger or ten times smaller than the principal unit." These are indicated by prefixes of which those denoting multiples are taken from the Greek and those denoting submultiples from the Latin language. The metric system was legalized in Great Britain in 1864 and in this country two years later (July 27, 1866). It is in daily use in the old world by more than one hundred and thirty-five millions of people. The appendix to the address contains a long and elaborate article on the unification of moneys, of value to practical economists, and in which, among much other interesting matter, is given a sketch of the new system of coinage in Japan. Another on measures of capacity and the weight of given volumes of water, worthy of attention from scientific students. Another on British legislation in regard to the metric system, and another, supplemental to certain chapters in the body of the work, on the extent to which the metric system has been already adopted.

The Amateur Microscopist, or views of the microscopic world. By John Brocklesby, A M. New York: William Wood & Company.

The author of this work justly remarks that "a few years ago the microscope was simply regarded as a costly toy, but now its value is appreciated in almost every department of physical science." The utility of a magnifying glass in determining the varieties of iron has been very fully demonstrated abroad, and in this country it has been suggested as affording a cheap, ready and efficient means of ascertaining the internal condition of bridge and other timbers; a boring too small to weaken the timber but large enough to show the state of the fibers being taken out for examination. Applications like those just noted, and others of similar tenor, can be best encouraged by promoting a popular taste for study and experiment with the microscope, and in this the little work before us will be found of much value. To young engineers and mechanics who wish to go down to the foundation of things, the chapter on the structure of wood, etc., will be of particular interest.

Snow's Pathfinder Guide, which is a complete guide to the railroads of New England and the eastern provinces of the Dominion, in its June number gives a new, very handsome and very clear map of New England, showing all the towns in each State, and with the railroads complete to date, or very nearly.

English Freight Locomotive.

The following description and the accompanying engravings, which we copy from *Engineering*, are of a freight locomotive, or "goods" locomotive, as it is called in England, constructed for the London, Brighton & South Coast Railway, in its shops at Brighton, from the designs of its Locomotive Superintendent, Mr. William Stroudley:

The great increase of late years in the passenger service on our main lines of railway has not been without an important influence upon the working of the goods and mineral traffic, itself also vastly increased. The necessity of keeping the latter traffic clear of the former has rendered it requisite that the goods trains should frequently be run at higher speeds than is perhaps consistent with economy, while it has above all become desirable that the engines employed for hauling such trains should be thoroughly "up to their work," and should be capable of taking their loads in all weathers without risk of causing vexatious delays. On some lines also it has been deemed advisable to run heavier goods trains so as to diminish their number, and altogether a demand has arisen for goods engines of greater power.

It is thus we find that on several of our main lines new types of goods engines either have lately or are now being introduced, and among these is the new class of goods engines for the London, Brighton & South Coast Railway, recently constructed from the designs of the Locomotive Superintendent of the line, Mr. W. Stroudley. Of one of these engines we this week publish a two-page engraving, and also a perspective view and a series of transverse sections respectively. From these various views it will be seen that the engine we illustrate has many new features well worthy of notice, and to some of these we shall proceed to direct attention.

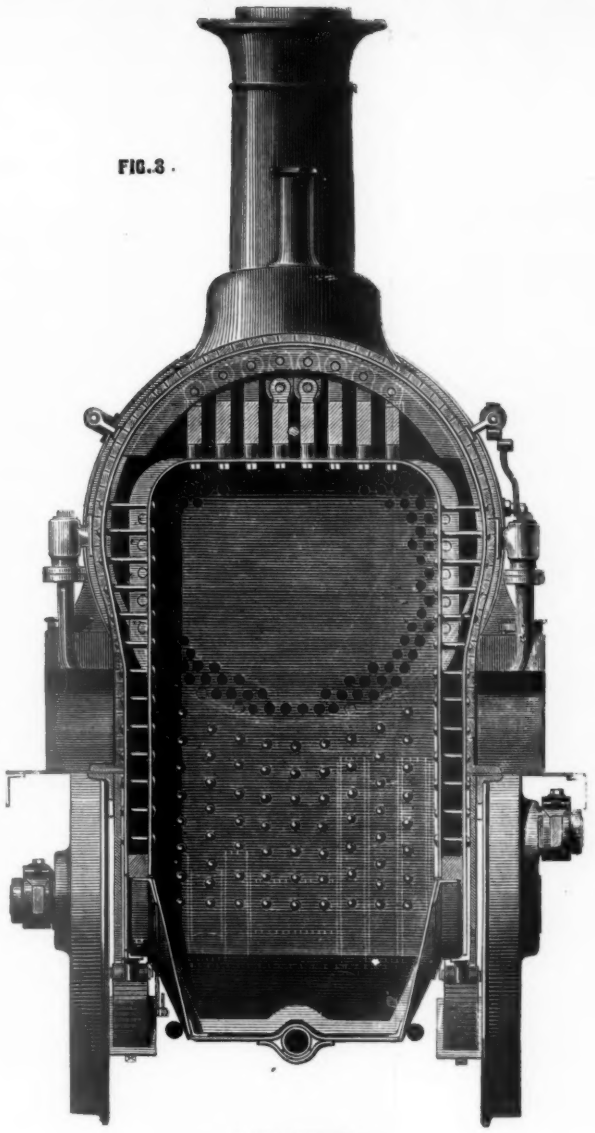
On the 4ft. 8½in. gauge, with the arrangement of inside cylinders ordinarily adopted for six-coupled goods engines, several difficulties are met with when the cylinders become of large size, say, exceeding 17 in. in diameter. Thus the space for the slide valves becomes inconveniently reduced, and there is a difficulty in providing for the driving axles and axle-boxes, &c., an amount of bearing surface proportionate to the cylinder power. This difficulty Mr. Stroudley has got over by adopting the arrangement of cylinders, shown by the transverse section, fig. 4. From this view it will be seen that the cylinders are both made in one casting, together with steam chest, exhaust and steam branches, &c., this, with the valve faces being underneath, enabling their centers to be brought in to 2ft. 1in. This enables long bearings to be given to the axles, and affords space for wide slide bars, horn blocks, and crank arms, as also for wide eccentric pulleys and expansion links. The valve faces also are very readily accessible, while the joint between the cylinders is done away with.

Mr. Stroudley holds the opinion—an opinion which we share—that a goods engine cannot be so well made with outside frames as with inside frames only, as for a given power engines of the former class are heavier and are more likely to break their axles and side rods, &c. The engine which we are now describing is of the inside frame type, the frame plates being made very deep throughout and well stayed transversely. In putting the frames together all the holes were carefully rimered out and fitted with turned rivets driven in and riveted cold.

The boiler is flush topped and of ample size, and it is made with wide water spaces both for the firebox and between the tubes, the former spaces being from 3in. at bottom to 6in. and 7in. at the top, and the tubes having ⅝in. spaces between at the firebox and ⅜in. at the smokebox end: the roof of the firebox is also well stayed with 2in. water spaces between bottom of stays and crown of box. The space between the roof bars also is quite clear, as there are no longitudinal stays, the smokebox tube plate being stiffened by a strong 5½in. by 3½in. angle iron arranged as shown in the longitudinal section and transverse section, fig. 5, while the back plate of the firebox casing is stayed to the ends of the firebox crown bars by means of copper stays screwed into the latter, as shown in the longitudinal section.

The barrel of the boiler is made of three plates having only one seam each, while the covering plate for the firebox casing is in one, extending from the bottom of firebox on one side, quite over to the bottom of firebox on the other side. The man-hole ring is of sufficient cross section to bring up the strength of the boiler at the man-hole to equal that of the strongest seam, and the longitudinal seams are all double riveted with butt-strips inside and out, the latter being countersunk to enable the rivets to fill the holes well up. The corners of the firebox and also of the firebox casing are of large radius, that of the former being 3 in. and that of the latter 6 in. The angle ring for joining the barrel to the front tube plate is welded up, turned, and bored, and double riveted to the barrel of the boiler. The tubes—which incline upwards towards the smokebox—are small, being 1¾ in. outside diameter, and No. 11 and 12 wire gauge thick, while the thin ends are placed next the firebox, instead of next the smokebox as is the usual practice. Steel ferrules are used at the firebox end, but none at the smokebox end. It should be noticed also

FIG. 3.



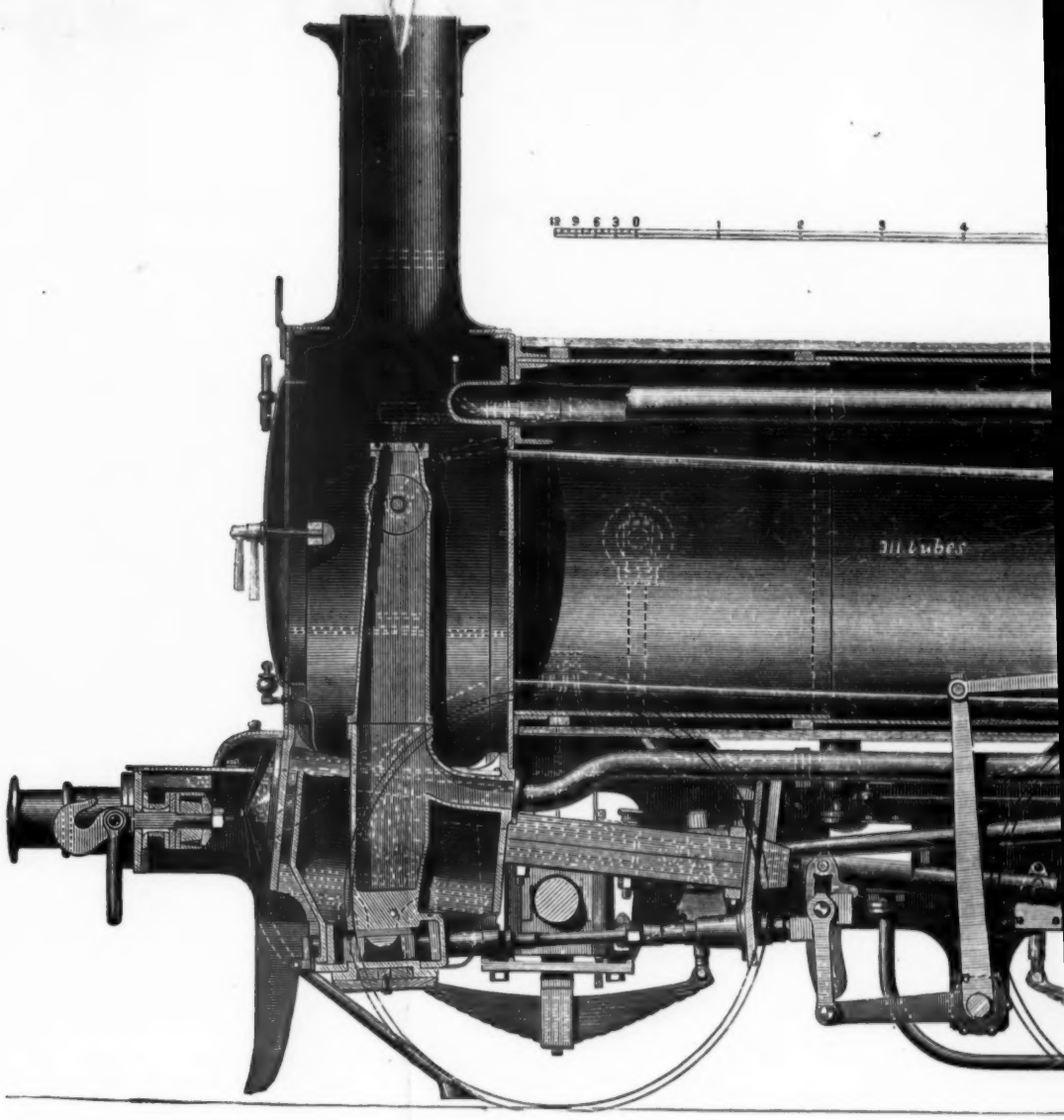
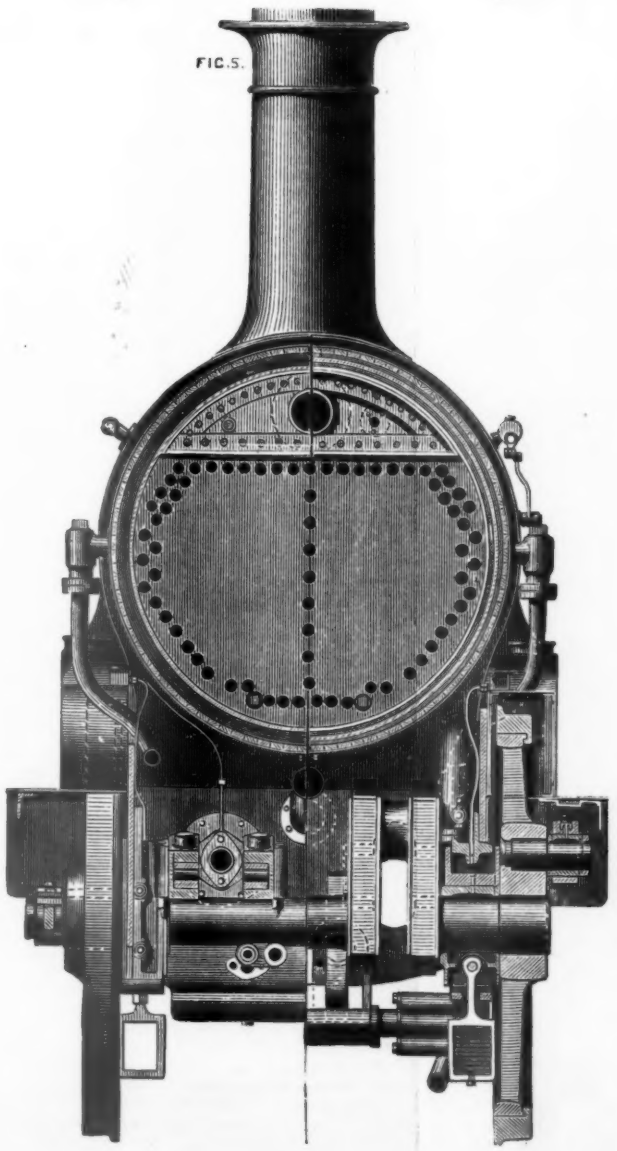


FIG. 5.



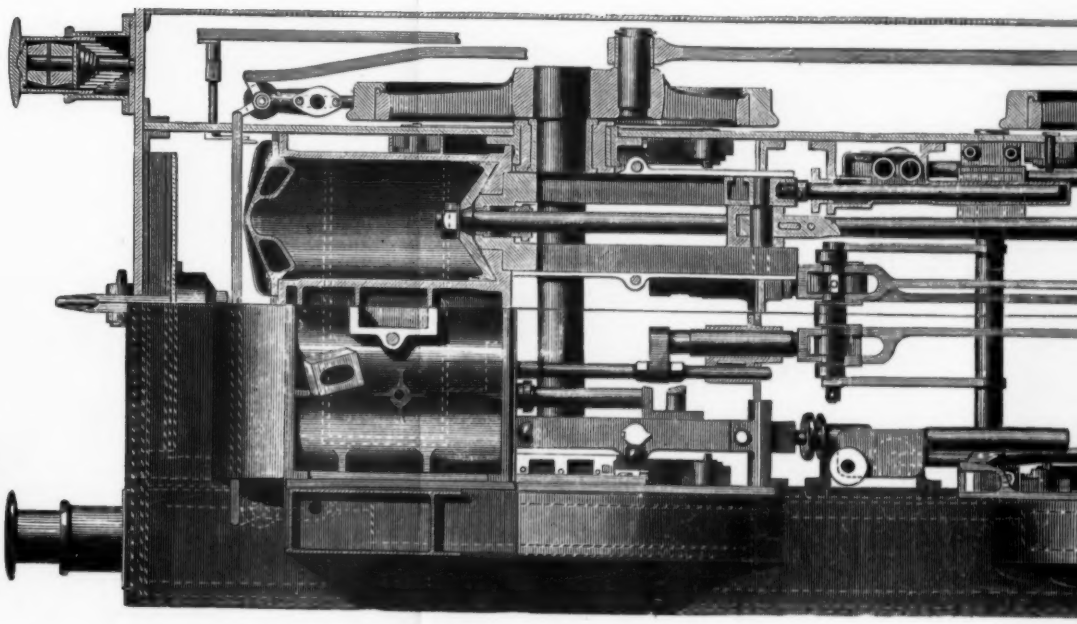
DIMENSIONS:

DIAMETER OF CYLINDERS.....

STROKE.....

DIAMETER OF WHEELS.....

FIRE-GRATE AREA.....

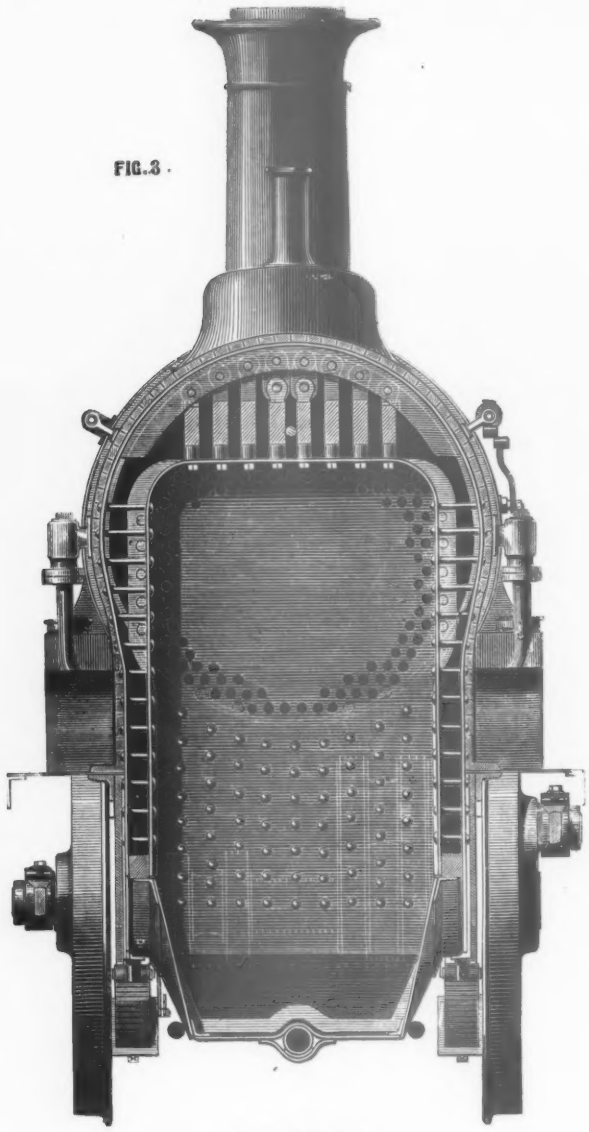


ENGLISH FR

CONSTRUCTED AT THE BRIGHTON SHO

From the Designs of W

FIG.3.



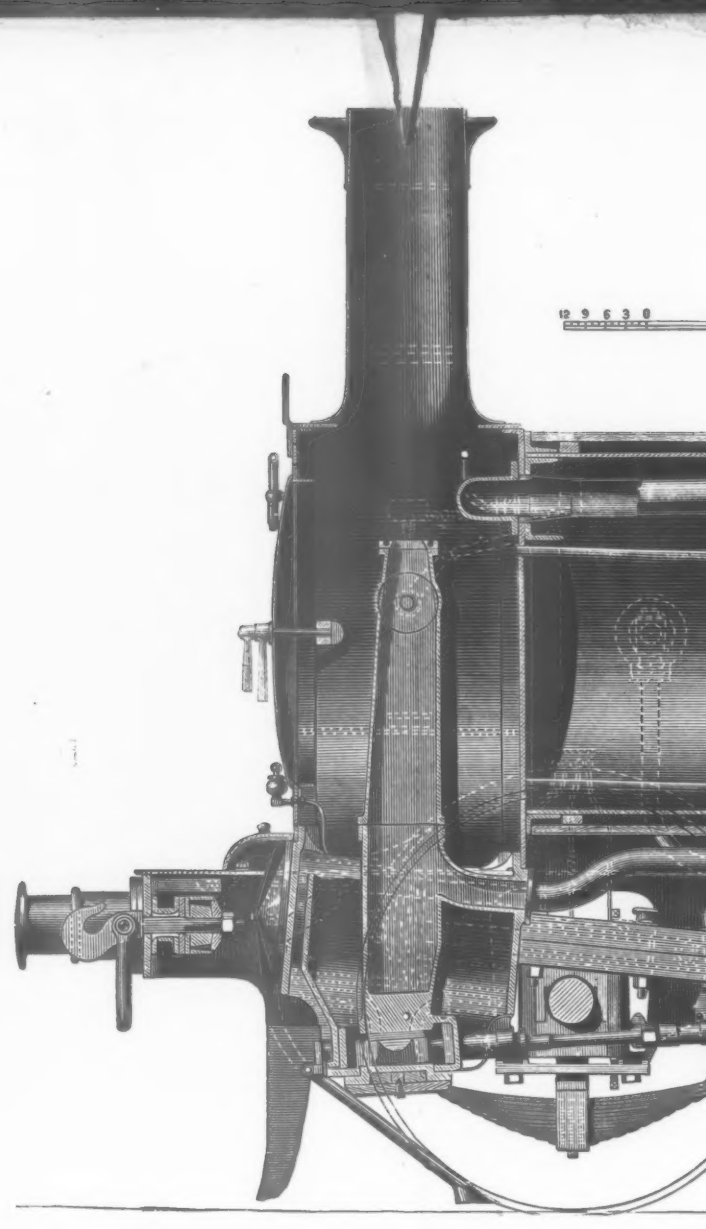
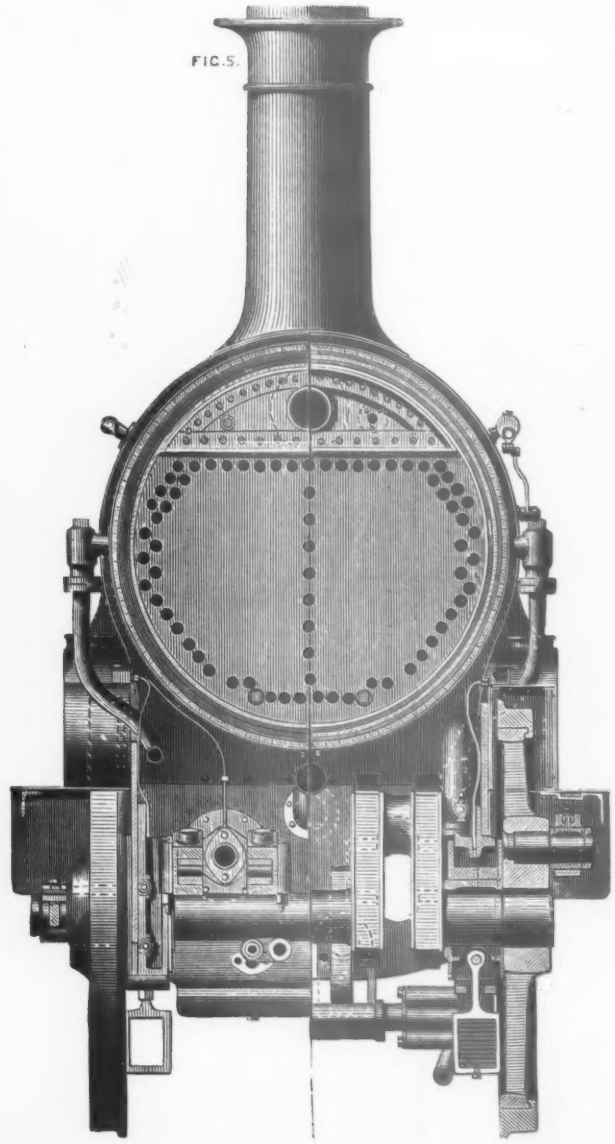
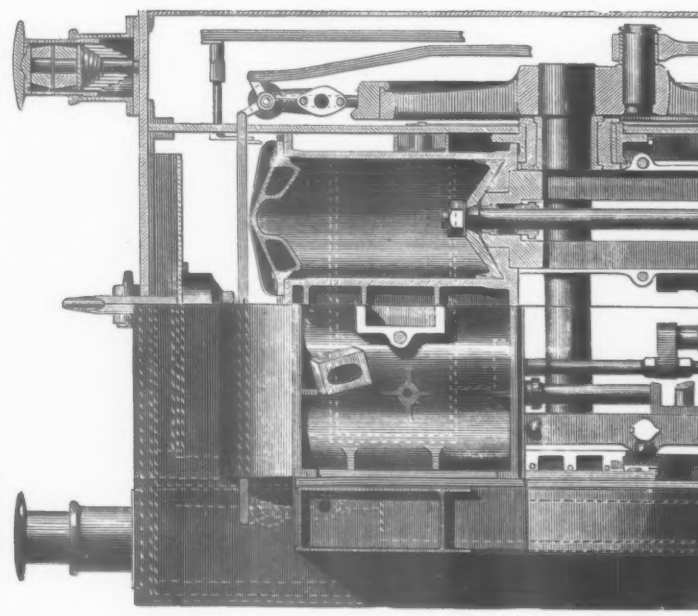


FIG.5.





DIMENSIONS:
DIAMETER OF CYL
STROKE.....
DIAMETER OF WH
FIRE-GRATE AREA.

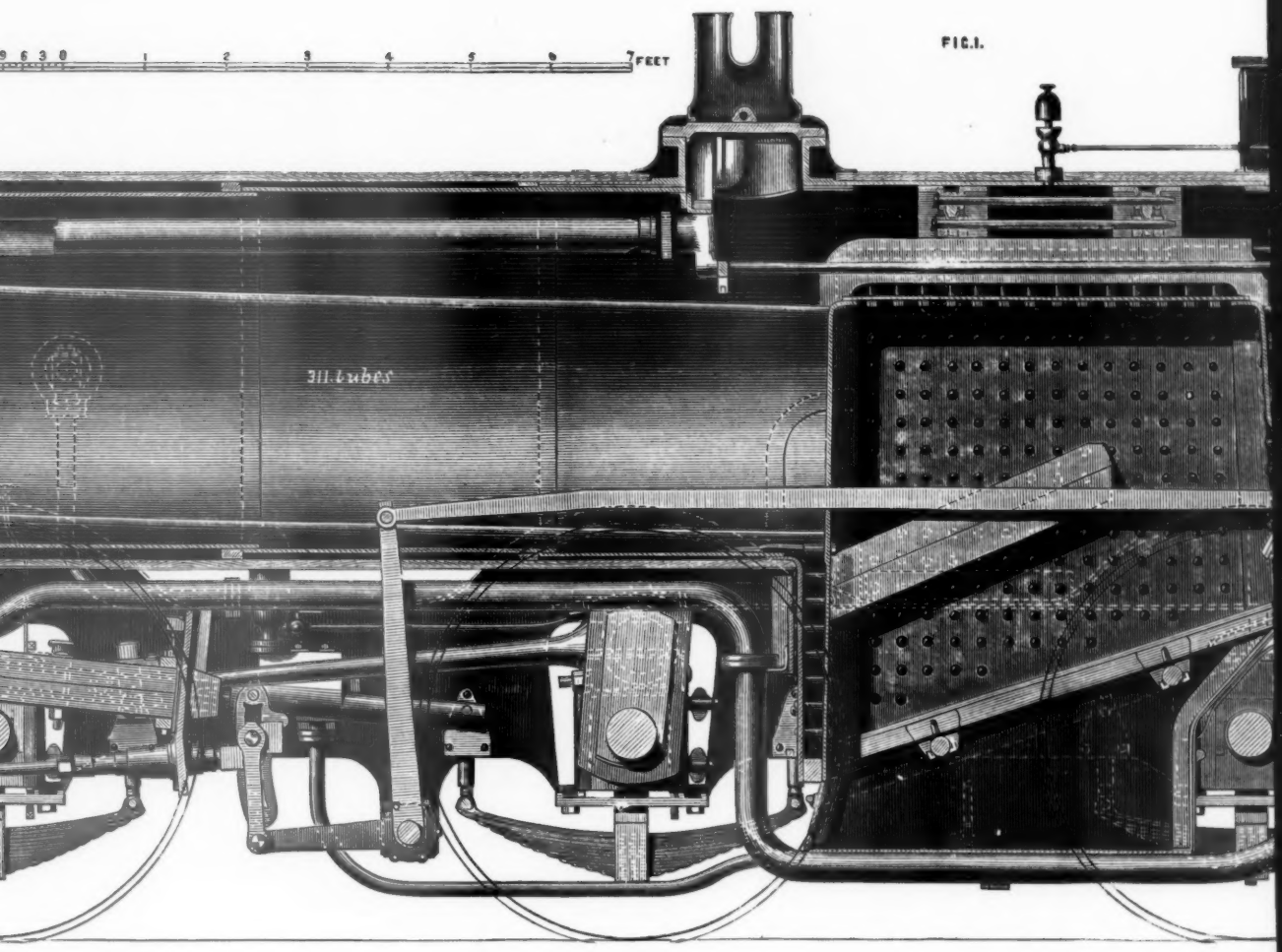


FIG.1.

DIMENSIONS:	*Feet.*	*Inches.*
DIAMETER OF CYLINDERS	1	5¼
STROKE	2	2
DIAMETER OF WHEELS	5	0
GRATE AREA	20	*Sq. Ft.*

HEATING SURFACE:	*Square Feet.*
FIRE-BOX	103
TUBES (outside)	1312
Total	1414

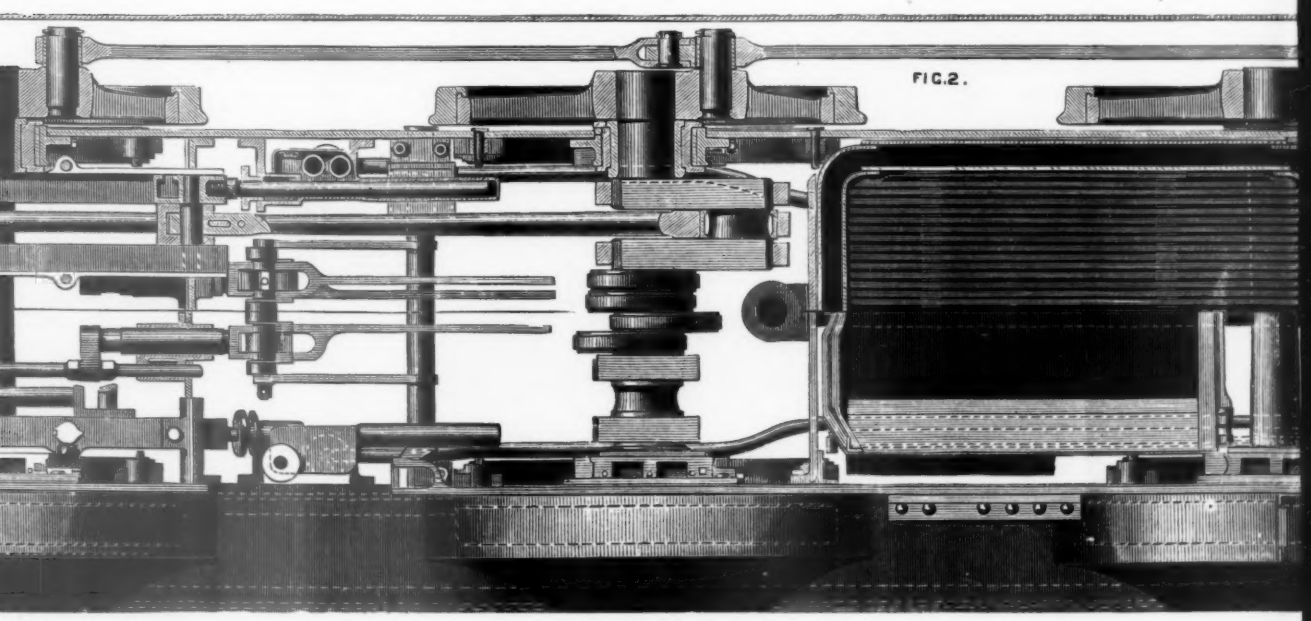


FIG.2.

ENGLISH FREIGHT LOCOMOTIVE,

CONSTRUCTED AT THE BRIGHTON SHOPS OF THE LONDON, BRIGHTON AND SOUTH COAST RAILWAY

From the Designs of W. STROUDLEY, Locomotive Superintendent.

FEET

FIG.1.

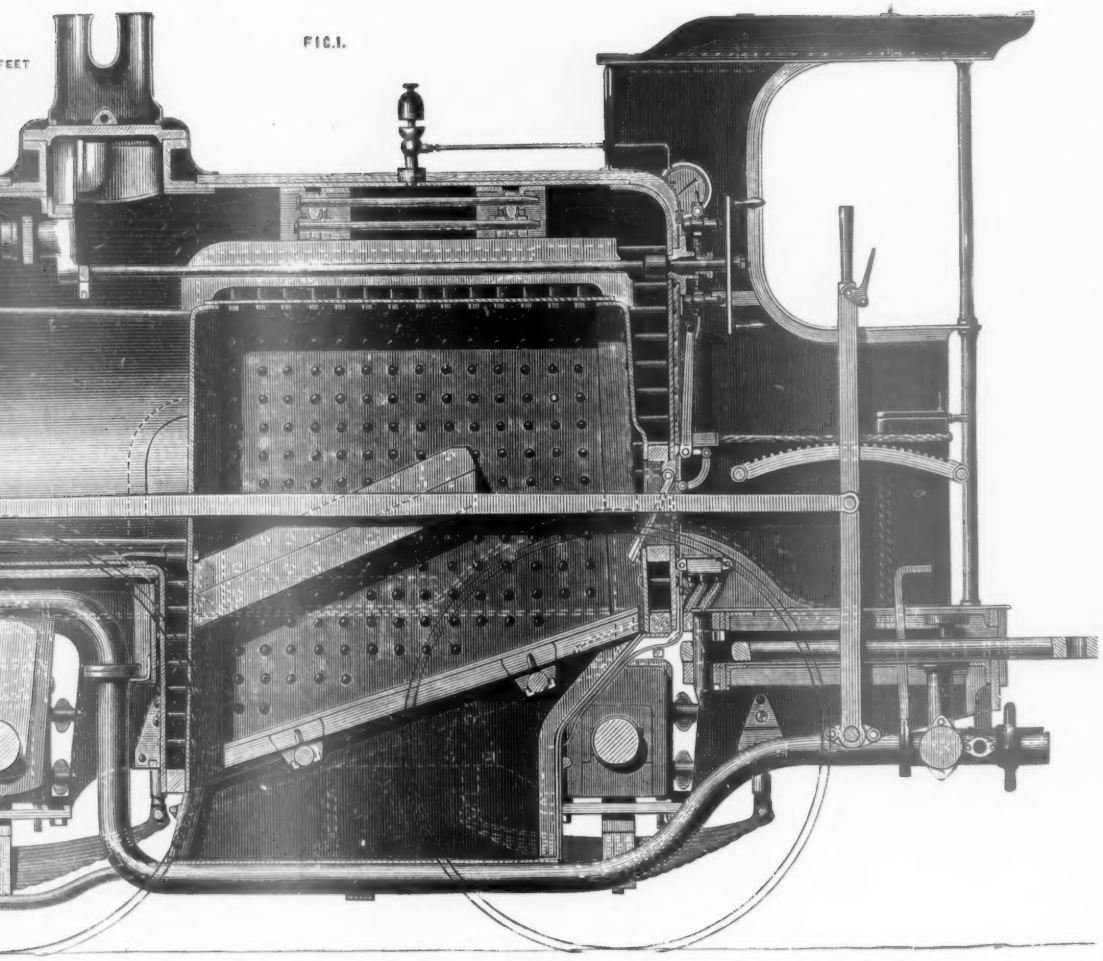
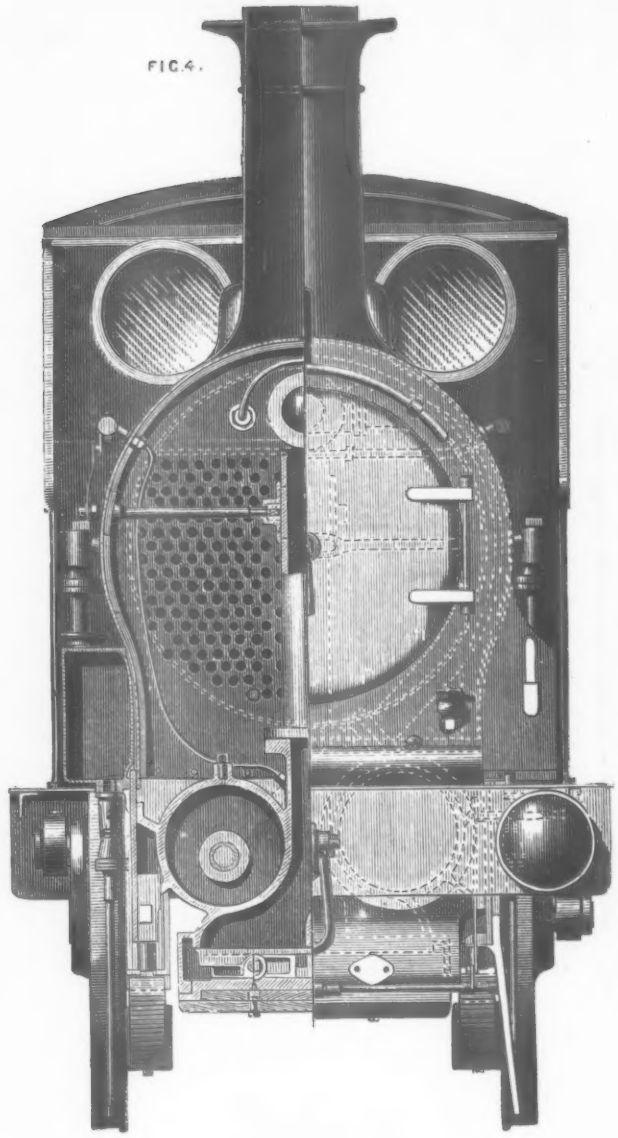


FIG.4.



ATING SURFACE:

	Square Feet.
FIRE-BOX	102
TUBES (outside)	1312
Total	1414

FIG.2.

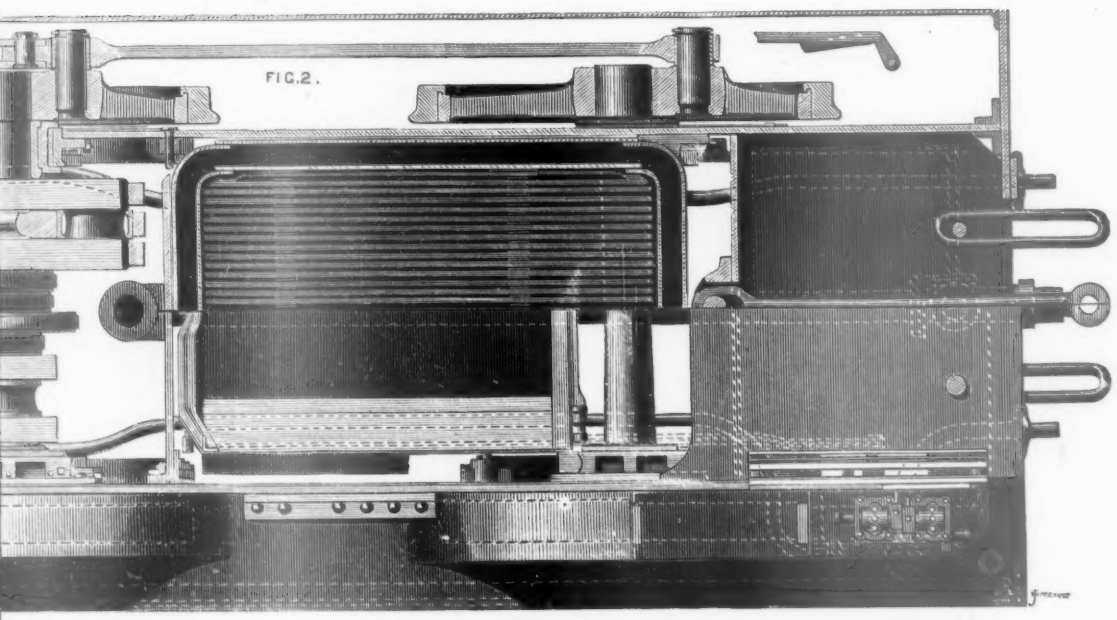
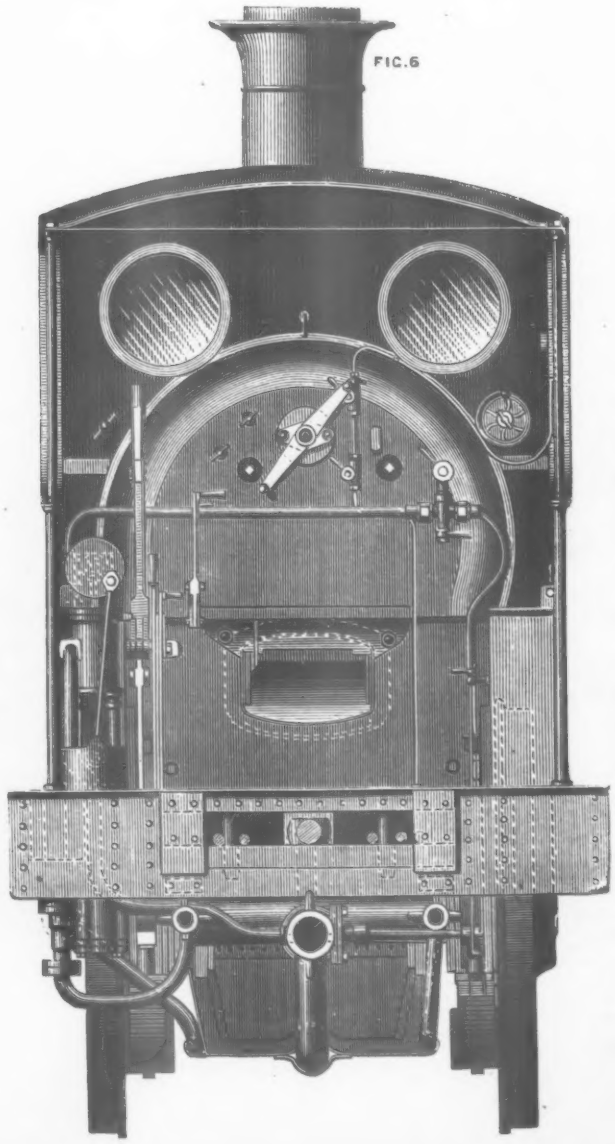


FIG.6



LOCOMOTIVE,

DON, BRIGHTON AND SOUTH COAST RAILWAY

Locomotive Superintendent.

that all the holes in the boilers are drilled and all the edges of the plates planed.

Turning now to the working gear, it will be noticed that the piston rods, which are of steel, are made each in one piece with its crosshead, the part of each rod which enters the piston being made with a steep taper, so that on taking off the nut on the front side the piston rod can be at once drawn through the stuffing-box of the cylinder cover. The glands and packing rings are made in halves, the two halves of each gland being held together by a ring which embraces a projection on the outer end of the gland. By making each piston rod in one piece with its crosshead, cotters through the rods are done away with and room is obtained for somewhat longer connecting rods than could be employed with the ordinary arrangement. In the engine under notice, the length of the connecting rod is 6 ft. 6 in., or three times the stroke.

The guide bars are of L-section, so that when the top and bottom bars of each pair are bolted together they form guides of [—section, closed at the sides so as to exclude dirt, &c. The bars of each pair, it will be noticed, are bolted together at the middle of their length so that the strength of the two bars is available to resist strain in either direction; this, together with the form of the bar, makes them exceedingly stiff guides. It will be seen from the longitudinal section and plan, that the motion plate is kept well forward, the guide bars projecting through it. The connecting rods have large ends of the marine engine pattern, the brasses being held by a cap secured by two bolts as shown. The brasses at the large ends are lined with white metal, but at the small ends no brasses are used, the crosshead pins, which are of steel, working against the case-hardened surfaces of the rod and strap. The valve motion is of the shifting-link class, with large bearing surfaces throughout, and a coiled spring placed on the weigh-bar is employed instead of the usual counterweights.

The cranks for the outside coupling rods are placed on the same centers as the piston cranks, or in other words, they are in the same conditions as those of an outside-cylinder engine, the object of this being to avoid unnecessary strain on the driving axle-boxes and to prevent slipping of the wheels, as is the case when the coupling rods of ordinary goods engines become at all slack.

The position of the slide valves under the cylinder drains off the water readily and also gives a very free exhaust, while in addition to the blast orifice, which is large, namely, 4¼in., there is a 4-inch pipe from the exhaust passage in cylinders to the surface of the water in the tender. A stop valve is provided in the blast pipe worked from the foot plate, as also another in the 4-inch heating pipe, the object being to shut nearly all the blast off the fire when shunting at stations so as to avoid waste of steam at the safety valves and to heat up the water in the tender. By this means the feed-water is generally heated to boiling point, and to still further avoid waste, a steam donkey pump is provided on the footplate, this pump being large enough to supply the boiler should the other pumps fail. The ordinary pumps are made with 2ft. 2in. stroke and have 2in. rams; they have each two suction clacks and two delivery clacks, 2in. and 2¼in. in diameter respectively, and with a very small amount of lift, namely, ¼in., but still giving plenty of water without percussion at high speeds. The smooth working of the pumps is further assisted by an air vessel which is provided on the top feed-pipe. We may mention here that in his express engines Mr. Stroudley employs three suction and three delivery clacks of the sizes above given.

Throughout the whole of the engine care has been taken to proportion the parts well to the strain put upon them, and the whole of the valve motion, crossheads, gudgeons, small ends and strap of connecting rods, outside crank pins and rods, as also reversing gear and all nuts, are thoroughly case-hardened. The engines are fitted with Adams' patent safety valves, these valves having an overhanging lip or rim against which the steam strikes when blowing off. It is found that with these valves the pressure cannot be raised more than 1 lb. per square inch above the blowing-off point. The engines are also provided with a cab over the driver, giving ample protection from the weather, but not in the least degree interfering with the look-out. The whole of the handles are placed close to the driver or fireman's hand, so that they need not move from their places to perform any duty required except putting on coals, this being rightly considered by Mr. Stroudley to be of importance on crowded railways. All the joints about the engine are perfectly faced and the flanges of all pipes, &c., are made thick, so that the joints can be made perfectly steam-tight with out the use of any red lead or other cement, the surfaces merely having a little boiler oil applied to them.

Referring to the plan on our two-page engraving, it will be seen that the buffers are made with both steel and india-rubber springs, the arrangement being such that the steel volute spring comes first into play, while the india-rubber is capable of acting after the steel spring has been forced home. At the trailing end it will be noticed that the pin for the draw bar has been placed as far forward as possible.

We subjoin a list of the principal dimensions of the engine we have been describing:

	ft.	in.
Cylinders:		
Angle of cylinders	1 in 11½	
Diameter "	1	5¼
Length of stroke	1	9
Distance apart from center to center	2	1
Length of ports	1	3
Breadth of steam ports	0	1⅝
" exhaust port	0	2
" bars	0	1⅛
Diameter of steam pipe	0	5
Centers of valve spindles	1	5
Diameter of blast nozzle	0	4½
Height " " above center of boiler	1	0¾
Area of blast pipes at bottom	28 square inches	
Slide Valves (Brass):	ft.	in.
Travel in full gear	0	3¾
Lap	0	0⅝
Lead	0	0½
Working Gear:		
Length in connecting rods between centers	6	6
Diameter at small end	0	2⅝
" large end	0	3⅜
" of bolts at large end (two)	0	2⅜
Section of cotters at small end	1in. × 3⅜in.	
Diameter of crosshead pins	0	3
Length " " bearings	0	3
Length of slide blocks	0	11
Width of bearing surface on each pair of slide bars	0	4
Diameter of piston rods (steel)	0	2¾
" eccentrics (cast iron)	1	4
Travel of eccentrics	0	5¾
Width "	0	3
Length of eccentric rods	4	7
Radius of expansion link	4	7
Length of expansion link between end centers	1	6
Thickness of expansion link	0	3
Distance of center of studs for lifting links above center of expansion link	0	2½
Horizontal distance from center line of driving axle to center of weigh bar	2	8¼
Distance of center line of weigh bar below horizontal line through the center of the driving axle	1	2¾
Length of lifting arms	1	10
" " links	1	3
Inclination of center line of valve motion 1 in 16½ downward towards leading end		
Transverse distance between center lines of expansion links	0	9
Diameter of plungers in valve spindle guides	0	3½
Length of valve spindle guides	0	11
Pumps (Brass):		
Diameter of plungers	0	2
Length of stroke	2	2
Donkey Pump:		
Diameter of steam cylinder	0	6
" pump plunger	0	3
Length of stroke	0	6
Boiler (Monkbridge plates):		
Length of barrel	10	4
Diameter outside largest plate	4	6
Height of center line of boiler from rails	6	10½
Thickness of plates	0	0⅞
" tube-plate	0	0¾
Length of outside firebox, outside	6	9⅞
Breadth of outside firebox, at bottom	4	1
" " top	4	7⅜
Thickness of plates	0	0⅞
Inside firebox (Copper; Allan, Everfit & Co.'s).		
Length inside at bottom	5	6
" " top	5	8
Breadth inside at bottom	3	5
" " top	3	5
Height (bars to crown) front end	5	3
" " back end	3	10
Thickness of plates	0	0⅞
" tube plates	0	0½
Water space, front, at bottom	0	3
" back "	0	3
" " top	0	6
" sides at bottom	0	3
" " top	0	6
Distance between crowns of inside and outside fireboxes	1	4
Number of crown stays, 8.		
Distance from center to center of stays	0	4
Depth of center	0	6½
Thickness of center	0	2
Centers of copper stays	0	4
Diameter "	0	0⅞
Pitch of thread on copper stays, 12 to the inch.		
Tubes (Brass; Allan, Everfit & Co.'s):		
Length	10	11
Diameter outside	0	1⅝
Thickness wire gauge, Nos. 11 and 12.		
Number	311	
Water space between ⅝in. and ⅞in. in horizontal rows	0	0⅝
	sq. ft.	
Heating surface: Firebox	102	
" Tubes (outside)	1,312	
Total	1.414	
Firegrate area	20	
Smokebox (Parkgate plates):		
Length outside	1	8½
Breadth "	5	0
Diameter of door	3	9
Thickness of plates	0	0⅝
Height of chimney from rails	13	2
Diameter at bottom	1	5
" top	1	4
Safety Valves (Brass; Adams' patent):		
Diameter	0	2½
Number of valves	2	
Load on valves 140 lb. per square inch.		
Wheels:		
Diameter	5	0
Centers, leading to driving	7	9
" driving to trailing	7	6
Total wheel base	15	3
Distance of center line of driving axle from front of firebox casing	2	0½
Distance between backs of tyres	4	5½
Width of tyres (Krupp's steel)	0	5¼
Crank Axle (Wrought iron; Cooper's):		
Diameter at center	8	7½
" in nave of wheel	8	8¼
" of crank pin	0	5¾
Hoop	3½in. × 2½in.	
Crank arm	10in. × 4½in.	
Diameter of inside bearings	0	8
Length " "	0	8⅝
Center to center of bearing	3	11¾
Depth through nave of wheel	0	7
Diameter of " "	0	15
Leading and trailing axles (Wrought iron; Lowmoor):		
Diameter at center	0	6½
" in nave of wheel	0	8¾
" of bearings	0	7
Length of bearings	0	8
Center to center of bearings	3	11¾
Depth through nave of wheel	0	7
Diameter of " "	0	15
Frames (Monkbridge iron):		
Outside angle iron, width	0	2½
" " depth	0	4½
" " thickness	0	0⅝
Distance apart of inside frames	4	1½
Least depth	1	7
Thickness	0	1⅜
Height of foot-plate from rail	4	0
Total length over frames	24	9
Width over foot-plates	7	7⅝
Height of foot-plate from rail	4	0
Springs:		
Length of leading and trailing springs	3	6
Breadth " " "	0	6
Depth " " "	0	6⅝
Camber " " "	0	3½
Number of plates	17	
Length of driving springs	4	0
Breadth " "	0	5
Depth " "	0	6⅝
Camber " "	0	4
Number of plates	17	

Weight of Engine when Full:	tons.	cwt.
Weight on leading wheels	13	0
" on driving wheels	14	12
" on trailing wheels	11	0
Total weight road-worthy	38	12
Weight of Engine when Empty:		
Weight on leading wheels	12.	0
" on driving wheels	13	11
" on trailing wheels	10	1
Total weight empty	35	12

One of the engines we have described has been working upwards of two months, and its great tractive and boiler power show to advantage, rendering the use of pilot engines unnecessary, while at the same time, the consumption of coal is fully 10 lb. per mile below the average of the other engines doing exactly the same work or less, by having assistance. The strain on the couplings is also found to be less with a strong engine giving out a steady pull than with a weaker one that slips and snatches, thus contributing to the safety of the working of the traffic by steady working both up and down inclines. Altogether the engines have proved very successful, and as we have already remarked, they include many features which will render them of interest to our readers. In conclusion, we should state that we are indebted to Mr. Stroudley for the use of the drawings from which our illustrations have been prepared.

East Tennessee, Virginia & Georgia.

Mr. R. T. Wilson, President of this company, gives notice that proposals for the sale to the company of $30,000 of its bonds, for the sinking fund, will be received at his office, No. 44 Broad street, New York, until July 1.

Chicago Railroad News.

Illinois Central.

This company has at last completed arrangements for a direct connection with New Orleans. The Mississippi Central and New Orleans, Jackson and Great Northern Railroad companies have agreed to construct a road between Jackson, Tenn., and a point opposite Cairo, and to push the work forward as rapidly as possible until it is done. It is estimated that within a year the work will all be completed, and that cars will be run from Chicago to New Orleans without a change. This can be done by changing tracks on the opposite side of the Ohio, to accommodate the cars to the 5-feet gauge. Through trains will also be run from St. Louis to New Orleans, as soon as the section of railroad shall be completed. The St. Louis trains will take the Illinois Central track from Cairo to DuQuoin, as the St. Louis and Cairo trains now do. A new time table has been adopted by which the trains now run as follows:

	LEAVE.	ARRIVE.
St. Louis express	*7:30 A. M.	*9:00 P. M.
St. Louis fast line	†8:15 P. M.	†7:35 A. M.
Cairo mail	*7:30 A. M.	*9:00 A. M.
Cairo express	†8:15 P. M.	†7:35 A. M.
Springfield express	*7:30 A. M.	*9:00 P. M.
Keokuk passenger	*8:15 P. M.	*9:50 A. M.
On Saturdays this train will leave at	7:15 "	
Gilman passenger	*5:45 "	*9:50 A. M.
Saturdays this train will run to Champaign		
Hyde Park and Oak Woods	*6:10 A. M.	*7:47 A. M.
" "	8:00 "	9:19 "
" "	*12:10 P. M.	*9:50 "
" "	*3:00 "	*1:45 "
" "	*5:15 "	*6:15 "
" "	*6:10 "	*7:45 "

* Sundays excepted. † Saturdays excepted.

Chicago, Danville & Vincennes.

On Sunday, the 2d inst., this road established a new time table, so that the trains run as follows: Two passenger trains through to Danville daily, except Sunday. The 7:30 a. m. train, Evansville & Terre Haute express, arrives in Danville at 1 p. m., Terre Haute 3:30 p. m., Evansville, 9:25 p. m. The 5:30 p. m. train runs through cars to Lafayette, Ind., *via* St. Anne, arriving in Lafayette at 11:45 p. m., making close connection for Cincinnati and Indianapolis; also through to Danville, arriving at 11:25 p. m., daily, except Sunday.

This company is perfecting arrangements for the building of a depot on Halsted street not far from Fulton street.

Lake Shore & Michigan Southern.

This company changed its running time on Monday the 3d instant, so that trains leave Chicago as follows: Mail train at 7:40 a. m., by the old road and air line, Sundays excepted; the special New York Express leaves at 9:30 a. m., by the air line, Sundays excepted. This train has palace drawing-room and sleeping coach attached, connecting at Rochester with Wagner's drawing-room coaches for New York. The Elkhart accommodation train leaves at 4:10 p. m., Sundays excepted; the Atlantic Express leaves at 5:15 p. m., having palace sleeping cars that run through to New York without change; the night express leaves at 9 p. m., by way of the old road, having sleeping coaches for Toledo. Trains arrive at 6:30 a. m., 7:30 a. m., 10:10 a. m., 7:30 p. m., and 9:20 p. m.

New Railroad Depots.

The Illinois Central, Chicago Burlington & Quincy and Michigan Central Railroad Companies have determined to build a magnificent depot on the lake shore, between Randolph and Monroe streets. After the first day of July they will be able to get possession of the land by condemnation, even though the present opposers of the transaction should continue their opposition. But it is believed that Mr. Scammon will not further urge opposition to the project, since it is now regarded as hopeless. The companies have several architects at work upon plans, and it is designed to make the great Vanderbilt depot at New York a model in some respects, although it is said the projected building will be both larger and more costly than that structure. The dimensions proposed are reported to be 700 by 1,200 feet on the ground and 100 high. The area thus inclosed would be 19½ acres. Placing it in the position of the Grand Central depot in New York, it would occupy the entire space between Third and Fourth avenues from Forty-second street as far up as Forty-eighth. Or, putting it in a shape generally comprehensible, it would be equivalent to a building ten rods wide and a mile long.

The Chicago & Alton, the Pittsburgh, Fort Wayne & Chicago, and Milwaukee & St. Paul roads have also decided to build an immense depot extending from Madison to Van Buren street, between Canal street and the river. The Pittsburgh & Fort Wayne Company have been, for some time, buying up the land on this site, which belonged to private parties, and it now owns all but a single small lot, title to which will be acquired through the process of condemnation, unless the owner and the company can come to some mutual agreement about it.

The companies propose to commence next year freight and passenger depots, which will extend from Madison to Van Buren streets; the passenger depot occupying the site next to Canal street and the freight depot occupying the space next the river, leaving only space enough along the dock for a passageway for teams. The buildings will be constructed directly over the Adams street viaduct, leaving an arcade in the building so as not to obstruct the passageway. The engineers of the several companies are now engaged in consultation for the purpose of agreeing upon the plans for the buildings.

In addition to these, it is now understood that the Chicago, Decatur & St. Louis (late the Decatur & State Line), and the Chicago & Canada Southern roads are about making arrangements for the building of a depot on the ground between the Rock Island & Pacific and Lake Shore & Michigan Southern depot and the river. These, with the depot on Halsted street for the Colum-

bus, Chicago & Indiana Central road and the Chicago, Danville & Vincennes road will pretty well accommodate the business of the roads at present entering the city.

American Bridge Company.

This company has filed with the Secretary of State at Springfield a certificate of increase of capital from $50,000 to $100,000. Its business is on a scale not exceeded, we believe, it equaled, by any other bridge-building firm in America.

Pittsburgh, Cincinnati & St. Louis.

The change of time which took place last Sunday affects the leaving time of but two trains, the Indianapolis, Louisville & Cincinnati express, which leaves at 9:05 instead of 9:10 a. m., and the afternoon train to the same places, which now leaves at 6:10 instead of 6:20 p. m. The changes in arriving times are more numerous.

Railroad Property in Cook County.

The Committee on Equalization of Taxes of the County Commissioners of this county have reported as follows the nature and valuation of railroad property within the county:

2,667 acres of land, average value $73.05 per acre	$194,750 08
1,915 town lots, average value $685.64	1,307,2.4 14
210 miles, 2 065 feet of main track, average value per mile $2 347 88	494.4'3 28
118 miles, 3.3.9 feet side track, average value $1,542.90	183.604 58
Rolling stock, average value $1,367.47	288.535 40
Other personal property, average value $420.89	85,806 99
Fixed and stationary personal property, average value $1,705.46	359,853 00
Total assessed value of railroad property	$2,9.8,217 29

Personal.

T. M. Kellogg, late Division Engineer Second Division Illinois Central Railroad, was on Monday, May 21, the recipient of an elegant present from his former associates on the road, of a Jules Jurgensen chronometer watch and chain, appropriately inscribed. Mr. L. H. Clarke, Chief Engineer of the Illinois Central, made the presentation, and Mr. Kellogg, though completely surprised, responded.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—The New York Central & Hudson River Railroad Company's election was held June 5. The following were chosen Directors: Cornelius Vanderbilt, William H. Vanderbilt, Horace F. Clark, Augustus Schell, James Banker, Samuel F. Barger, Henry Baxter, Jos. Harker, of New York; Henry R. Pierson, of Albany; Chester W. Chapin, of Springfield, Mass.; George J. Whitney, of Rochester; James M. Marvin, of Saratoga Springs; Solomon D. Drullard, of Buffalo. Inspectors of the next election: Sidney T. Fairchild, Lansing Pruyn, of Albany; Nicholas B. Laban, of New York. About thirty millions of dollars worth of stock was represented.

—Mr. M. M. Towne, who has been for some years Train Dispatcher of the Chicago & Northwestern Railway at Boone, Iowa, has accepted an appointment as Assistant Superintendent of the Atchison & Nebraska Railroad, with headquarters at Atchison. Mr. Towne belongs to a railroad family, Mr. A. N. Towne, General Superintendent of the Central Pacific; Mr. H. A. Towne, Master Mechanic, and Mr. L. W. Towne, Assistant Superintendent of the Hannibal & St. Joseph Railroad, being his brothers—and all are distinguished as capable and conscientious officers.

—Mr. Frank L. Pope, the well-known electrician, one of the editors of the *Telegrapher*, has been made a member of the London Society of Telegraph Engineers, by which appointment the society does itself much honor.

—At the annual meeting of the Mobile & Ohio Railroad Company, held in Mobile, May 23, the following directors were chosen for the ensuing year without opposition: W. P. Halliday, Illinois; Thomas Brown, Kentucky; A. S. Humphries, C. E. Rushing, A. Murdock, Mississippi; James Crawford, W. D. Dunn, Charles Walsh, John Reid, Jr., John J. Walker, Francis B. Clark, Robert W. Smith, Alabama; Wm. Butler Duncan, New York. Mr. Halliday, who is the only new member of the board, is also a director of the Cairo & Vincennes Railroad; he succeeds Gen. A. W. Campbell, of Tennessee. The board re-elected its officers as follows: Hon. A. Murdock, President; Charles E. Rushing, Vice-President; J. J. Walker, Second Vice-President; A. L. Willoughby, Secretary and Treasurer; O. S. Beers, Auditor; George N. Stewart, General Solicitor.

—Mr. J. H. Rutter, late Assistant General Freight Agent of the Erie Railway, has been appointed General Freight Agent of the New York Central & Hudson River Railroad, in place of Solomon Drullard, resigned. Mr. Rutter entered upon his duties June 1. His office is at the Grand Central Depot, New York

—At a recent meeting of the board of directors of the Erie Railway Company, the following changes and appointments were made: B. W. Blanchard, previously General Freight Agent, General Manager of the Traffic Department; John M. Osborn, General Freight Agent; Edward T. Low, Assistant Freight Agent, and L. L. Lockwood, Purchasing Agent.

—At the annual meeting of stockholders of the Atlantic & Pacific Railroad Company, held in Boston, May 16, the following directors were chosen for the ensuing year: Francis B. Hayes, Uriel Crocker, Jacob Sleeper, Charles J. Morrill, George S. Curtis, of Boston; Andrew V. Stout, Wm. H. Coffin, Joseph Seligman, of New York; Frederick Billings, of Woodstock, Vt.; Andrew Pierce, Jr, Joseph Brown, of St. Louis; Oliver Ames, of North Easton, Mass; Ozias Bailey, White Cloud, Kansas. All these were in the old board.

—At the annual meeting of the Wilton Railroad Company, held at Nashua, N. H., May 29, William W. Bailey, Isaac Spalding, William Ramsdell Clarke, C. Boutwell, John Reed, were elected directors, and J Thornton Greeley, Clerk.

—Hon. Thomas Cornell, of Kingston, N. Y., has been chosen President of the Walkill Valley Railway Company, to succeed F. S. McKinstry, resigned. Mr. McKinstry remains a director.

—The twenty-seventh annual meeting of the Northern New Hampshire Railroad Company was held at Concord, N. H., May 29. The following board of directors was unanimously chosen: Onslow Stearns, Concord, N. H.; Geo. W. Nesmith, Franklin, N. H.; Josiah Minot, Concord, N. H.; John N. Burnham, Uriel Crocker, Joseph W. Clark and Charles F. Cuoate, Boston, Mass. At a subsequent meeting of the board of directors, William A. Tower, of Boston, was chosen President; Anson S. Marshall, of Concord, Clerk; and Moody Currier, of Manchester, N. H., Treasurer.

—At the annual meeting of the Nashua & Lowell Railroad Company, held at Nashua, N. H., May 29, the following officers were unanimously re-elected: Directors—Francis B. Crowninshield, Henry Sigourney, Boston, Mass.; Daniel S. Richardson, Lowell, Mass.; Edward Spalding, Nashua, N. H., and Onslow Stearns, Concord, N. H.; Treasurer, Theodore H. Wood, Nashua, N. H.; Clerk, Edward P. Emerson.

—At the annual meeting of the Merrimac & Connecticut River Railroad, at Concord, N. H., May 30, the following board of directors was chosen: Onslow Stearns and Josiah Minot, Concord, N. H.; John A. Burnham and Uriel Crocker, Boston, Mass.; George W. Nesmith, Franklin, N. H, and David Steele, Goffstown, N. H., all of whom were members of the old board. The board subsequently elected Onslow Stearns, President; Josiah Minot, Treasurer, and Charles P. Sanborn, Clerk.

—The stockholders of the Concord & Rochester Railroad Company met at Concord, N. H., May 28, and re-elected the old board of directors, as follows: Nathaniel White, John V. Barron, James R. Hill and Benjamin A. Kimball, Concord, N. H.; John McDuffie, Rochester, N. H.; Eliphalet Foss, Strafford, N. H.; Joshua M. Babcock, Barnstead, N. H.; J. H. Pearson and Enoch Childs.

—At the annual meeting of the New Hampshire Central Railroad Company, held at Centre Harbor, N. H., the following directors were chosen: Oscar F. Fowler, of Bristol; William Dyer, of Northampton; John W. Beede, of Meredith Village; W. H. H. Mason, of Moultonborough; Larkin P. Mason, of Tamworth; Henry J. Banks, of Ossipee. The Hon. O. F. Fowler was chosen President, with George T. Crawford, of Bristol, Clerk, and Cyrus Taylor, of Bristol, Treasurer.

—Colonel Orland Smith resigned his position as General Superintendent of the Springfield & Illinois Southeastern Railway, May 23, and George W. Norris late Assistant Superintendent, was appointed to the vacant position.

—At the annual meeting of the stockholders of the Mobile & Alabama Grand Trunk Railroad Company at Mobile, May 16, the old board of directors was re-elected, as follows: Francis B. Clark, M. Temple Taylor, Robert W. Smith, M. Waring, James Crawford, John Reid, Jr., Samuel G. Battle, Thomas St. John, Cary W. Butt, all of Mobile. At a meeting of the board of Directors, held at Mobile, May 17, the following officers were re-elected: Francis B. Clark, President; M. Temple Taylor, Vice President; E. M. Underhill, Secretary and Treasurer.

—At the annual meeting of the Illinois Central Railroad Company held in Chicago May 29, the directors whose terms had expired, Messrs. Abram S. Hewitt, William Tracy and W. H. Osborn, of New York, were re-elected, and Mr. W. K. Ackerman, of Chicago, was chosen a director to succeed Mr. J. M. Douglas, resigned. Mr. Ackerman was for many years Assistant Treasurer of the company, and for fifteen months past has been Treasurer.

—At the annual meeting of the Franklin & Portland Railroad Company at Tilton, N. H., June 1, the following Board of Directors was chosen: Stephen Kenrick, Franklin, N. H.; Asa P. Cate, Northfield, N. H.; Nahum White, Gilmanton, N. H.; Charles A. Hackett, Belmont, N. H.; Jonas B. Aiken, Charles E. Tilton, Amos A. Lawrence. Clerk, John W. Wells, Franklin, N. H.

—Mr. Joseph Smith, formerly Engineer and afterward Superintendent of the Keokuk & Hamilton Bridge, has been appointed Principal Assistant Engineer of the Hastings & Dakota Railroad.

—Mr. N. Weatherston, freight and passenger agent in Toronto for the Great Western Railway, and an experienced railroad man, has resigned to accept an appointment as General Superintendent of the Toronto, Grey & Bruce Railway.

—The following directors of the New York & Brooklyn Bridge Company were elected June 3: Henry C. Murphy, Abram S. Hewitt, Seymour L. Husted, Lloyd Aspinwall, James S. T. Stranahan, Alexander McCue, William H. Appleton, Henry W. Slocum, Isaac Van Anden, William H. Vanderbilt, William C. Kingsley, John H. Prentice, Demas Barnes, John W. Lewis, William Marshall. This is said to ensure the re-election of Mr. Kingsley as Superintendent. Abner C. Keeney and Charles C. Martin were elected inspectors.

—The Greenville & Rolling Fork Railroad Company was organized at Greenville, Miss., May 19, by the election of the following board of directors: L. B. Valliant, W. A Percy, John H. Nelson, N. B. Johnson, W. H. Bolton, W. A. Haycraft, J. Alexander.

—At the annual meeting of the stockholders of the Cumberland Coal and Iron Company the following officers were elected: Wm. M. Richards, President; Directors—G. T. Bourne, A. B. Baylis, H. P. Le Roy, Allare Campbell, G. B. Warren, Jr., W. H. Nilson, C. P. Leverich, J. G. Karn, Wm. Whiteright, Jr., W. B. Duncan, E. H. Tracy, J. K. Warren.

—Mr. A. H. Baldwin has been appointed General Superintendent of the West Wisconsin Railway in place of S. R. Stimson, resigned. Mr. Baldwin is Vice President of the company and a son of the President, Mr. D. A. Baldwin.

TRAFFIC AND EARNINGS.

—The Chicago, Danville & Vincennes Railroad, which has been open less than nine months, reports its earnings for April at $47,884.39, which is at the rate of $5,325 per mile per year, and a very good showing for so new a road.

—The estimated earnings of the Kansas Pacific Railway for the second week of May were: freight, $42,903.53; passengers, $32,086.06; total, $74.989.59. For the third week of May they were: freight, $42,755.92; passengers, $27,565.80; total, $70,321.72.

—The receipts of the Lake Shore & Michigan Southern Railway for the third week of May were: 1872, $303,847; 1871, 261,327; increase, $42,520, or 16¼ per cent.

—The receipts of the Toledo, Wabash & Western Railway for the third week of May were: 1872, $115,548; 1871, $106,097; increase, $9,451, or 9 per cent.

—The receipts of the St. Louis & Iron Mountain Railroad for the third week of May were: 1872, $45,594; 1871, $29,510; increase, $16,084, or 54½ per cent.

—The receipts of the St. Louis, Alton & Terre Haute Railroad for the third week of May were: 1872, $22,243; 1871, $21,643; increase, $600, or 2¾ per cent. The receipts of the St. Louis, Alton & Terre Haute, branches, for the same week were: 1872, $8,041; 1871, $7,501; increase, $540, or 7¼ per cent.

—The receipts of the Great Western Railway for the week ending May 17 were: 1872, £23,327; 1871, £17,534; increase, £5,693, or 32½ per cent.

—The receipts of the Grand Trunk Railway of Canada for the week ending May 18 were: 1872, £34,000; 1871, £28,400; increase, £5,600, or 19¾ per cent.

—The receipts of the Central Pacific Railroad have been:

For the month of May,	1872	$1,221.625
" "	1871	892,341
" "	1870	768,719
Increase this year over	1871 (37 per cent.)	329,284
" "	1870 (59 per cent.)	452,906
Earnings first 5 months,	1872	4,212,647
" "	1871	3 249,706
" "	18 0	2,698,090
Increase this year over	1871 (29½ per cent.)	962,941
" "	1870 (56 per cent.)	1,514,557

—The receipts of the St. Louis, Kansas City & Northern Railway for the month of May were: 1872, $280,933; 1871, $224,342; increase, $56,591, or 25 per cent.

OLD AND NEW ROADS.

Boston & Lowell.

The third instal'ment of $100 per share on the 1,477 new shares of $500 each voted February 6, 1871, will be due June 15. The two remaining are due December 1, 1872 and July 1, 1873. Dividends of 7 per cent. are paid on the installments and 6 per cent. on any anticipated installments.

Providence & Springfield.

A correspondent writing from Providence, R. I., says this road was put under contract two months ago and that work is now progressing rapidly. The portion now under contract extends from Providence westward to Pascoag, R. I., a distance of 22 miles; but the road is soon to be extended to Palmer, Mass., on the Boston & Albany road. L. M. E. Stone is Chief Engineer and Dillon & Clyde, contractors.

Delaware, Lackawanna & Western.

The "Joint Committee" of this and the Central Railroad Company of New Jersey announce that it is proposed to issue $3,000,000 worth of convertible bonds of the Delaware, Lackawanna & Western Railroad Company. They reserve the right of converting the bonds at any time between the first day of June, 1875, and the first of June, 1877, into the capital stock of the company, or such stock as may be substituted therefor at par, with a provision that should the company hereafter execute a mortgage to secure the payment of any other of its obligations, these bonds shall be included in such mortgages. The bonds are issued for construction purposes, as, under their charter, the Delaware, Lackawanna & Western Railroad Company cannot convert into stock except for construction account.

Long Island Railroad.

This company has opened its new branch to Rockaway, one of the finest seaside resorts near New York, and trains run from Hunter's Point to that place in about 40 minutes.

Erie Railway.

The company has declared a dividend of 2½ per cent. on the preferred stock, payable July 15. Transfer books close June 10.

The "Orange & Dutchess Railroad Ferry Company," recently organized with a capital of $800,000, is to carry freight from the Erie Railway at Newburg across the Hudson to the Dutchess & Columbia Railroad, which has connections with New England. If the Erie had the standard gauge, a large coal traffic might be cultivated by this route, and also a large grain traffic.

Philadelphia & Reading.

This company, it is reported, contemplates changing its great coal-shipping station from Port Richmond, near the northern border of Philadelphia, to some point near Chester, about ten miles below the city, the latter place being more accessible by vessels in winter.

Concord Railroad.

The thirty-first annual report of this road, for the year ending March 31, states the receipts for the year at $996,224.33 including $16,860.51 from the Clough suit. The expenditures were $668,160.99, leaving a balance of $328,063,34, from which $126,415.65 was paid for taxes and $150,000 for two 5 per cent. dividends to the Northern, Portsmouth and Manchester & Lawrence roads, and $50,800 for new cars and rails, leaving a balance of $847.69 carried to contingent fund, which fund now

amounts to $61,917 04. During the year $96,801.97 has been paid for engines and cars. Two locomotives, four passenger cars, one working and 93 freight cars have been put on the road, and one locomotive, two passenger cars and fifty freight cars are now being built. The conductors' suits are to be dismissed and the claims for detectives and attorneys' services are to be contested.

Elizabethtown & Paducah.

A correspondent writes of this important Kentucky line: "This road is fast nearing completion. There is now but about twelve miles of iron to lay, which Mr. Brock, the Superintendent, thinks will be completed by the 1st of July. The two iron bridges, of nearly a thousand feet each, built by the Louisville Bridge Company, over the Tennessee and Cumberland rivers, are well under way, and an effort will be made to have them ready, so that the road may be opened as soon as iron is laid. A line of telegraph is now in course of construction for the use of the road. The business of the road exceeds the expectations of the officers. The freight business, for the time the road has been in partial operation—not a year till October—is heavy, and daily on the increase. There are now open and being opened on the line of the road ten coal mines, some of which are now in a condition to load from fifteen to twenty cars per day."

Canada, Michigan & Chicago.

The Treasurer informs us that this company has contracted for the construction of its road in Michigan, from St. Clair to Lansing, to connect at the former place with the Canada Southern Railway, and at the latter with roads going on to Chicago and elsewhere. The grade of the road will not exceed forty feet to the mile. The company will require about ten or twelve (wood consuming) locomotives.

Atlantic & Great Western.

The stockholders of this company will meet at the office, No. 9 Nassau street, June 9, to consider and act upon the proposed leases of the Liberty & Vienna and the Niles & New Lisbon railroads.

Dividends.

The Hartford & New Haven make a dividend of 5 per cent. on the full stock and 2½ per cent. on the scrip stock, payable July 1.

The Panama railroad makes a quarterly dividend of 3 per cent., payable July 1.

The Erie railway divides 3½ per cent. for the current six months on the preferred stock, payable July 15.

Logansport, Crawfordsville & Southwestern.

This road is now completed to Camden, about 20 miles north of its late terminus at Frankfort, Ind., and over 13 miles south of the proposed northern terminus at Logansport, and this section of 13 miles is ready for the rails, which the company expects to have laid by the end of June.

Atlantic & Pacific.

It is reported that the negotiations between this company and the San Francisco committee have resulted satisfactorily, and that a delegation from San Francisco will meet at St. Louis on the 10th inst. to conclude the business. R. G. Sneath, C. T. Hopkins, John S. Hager, D. C. McRuer, I. G. Phelps, W. A. Aldrich, M. G. Upton, James O'Kane and Caleb F. Fay are expected to be in the delegation.

Mobile & Alabama Grand Trunk.

The State Commissioners of Alabama have recently examined a new section of 10 miles of this railroad, lately completed, which makes its total length from Mobile northward 43 miles. A large force is at work on a section 10 miles next north, and track-laying on this section is begun. Six miles more remain to be constructed in order to reach the point of crossing the Tombigbee River, —and on this section there will be much trestle work. It is expected, however, that the track will reach the river by August.

Manchester & Lawrence.

The twenty-fourth annual report of this New Hampshire railroad company has just been distributed to the stockholders. The earnings of the road, for the year ending March 3d, were $193,904 73, expenses $93, 39.61, leaving net earnings $100,565 12, from which have been paid two dividends of 5 per cent. each, $100,000, leaving a balance of $565.12. There was an increase over the previous year of 4,019 in the number of passengers carried, and of nearly 16,000 tons of freight, while the total mileage of trains was 1,710 miles less. The road-bed, track, buildings, &c., are in good condition, and the road is fenced for its entire length. Twenty five tons of new and 312 tons of welded rails have been laid during the year, and 7,730 new sleepers put in.

Cincinnati, Wabash & Michigan.

This road has been extended this year from Manchester, Ind. (on the Detroit, Eel River & Illinois Railroad), south to Warsaw (on the Pittsburgh, Fort Wayne & Chicago road), a distance of 12 miles.

Louisville & Nashville.

At a recent meeting of the stockholders it was resolved to extend the Knoxville Branch from its present terminus at Livingston, Laurel County, Ky. (140 miles southeast from Louisville), south to the Tennessee line, about 50 miles. The directors were authorized to issue $2,500,000 of bonds secured by a mortgage on the Memphis, Clarksville & Louisville Railroad, from the proceeds of which the South & North Alabama Railroad is to be completed. The company has been and is constructing the South & North Alabama Railroad, for which, when completed, it will receive 8 per cent. bonds of the Alabama company to the amount of $3,600,000, guaranteed by the State of Alabama. Concerning these the following resolutions were passed:

Resolved, That the President and directors of this company are hereby authorized to indorse and guarantee, in the name of the Louisville & Nashville Railroad Company, the bonds of the South & North Alabama Railroad Company, and negotiate the same for the best price that can be obtained; and should said latter-named company conclude to cancel the present mortgage and take up the present bonds, and to issue other bonds, and to make another mortgage at a less rate of interest, provided satisfactory terms of exchange can be agreed upon, that the President and directors be authorized to assent thereto for this company, and upon the receipt of a sufficient number of the latter-named bonds to deliver up to said company the $3,600,000 of 8 per cent. bonds for cancelation, and in the event of their receiving the said bonds in lieu of the said 8 per cent. bonds, received and to be received of the South & North Alabama Railroad Company, that they be and are hereby authorized to indorse and guarantee, in the name of this company, the payment of said bonds, and sell the same for the best price they can obtain.

Resolved, That inasmuch as this company has now a complete line of road to the city of Memphis, and will shortly have a line completed to Montgomery, Ala., and probably to Cumberland Gap, or the State line, in the direction of Knoxville, Tenn., making about 1,000 miles of railroad, and as these connections may be made more profitable by giving aid to such companies as connect at these and other points along our lines, and contribute to the business of our company, it be left to the discretion of the President and directors to aid such latter-named companies by any arrangements in the shape of the loan of its credit or otherwise as would best protect and promote the interests of this company.

Pennsylvania Railroad.

Beginning with June 3, this company has received freight for Philadelphia at Pier 39, North River, foot of Desbrosses street, New York, to be loaded into cars at the pier and sent through to Philadelphia without breaking bulk and delivered at the Walnut street wharf before business hours the morning after the day of shipment. Freight is received at this place until 6 p. m. Shipments are made similarly from the Walnut street wharf in Philadelphia up to 5 p. m., each day, to arrive at Pier 39, New York, the following morning. Shipments for Philadelphia are also received at Pier 16, foot of Courtlandt street, New York, to be delivered at Kensington, and at Kensington to be delivered at Pier 16, in both cases arriving at destination early in the morning the day after shipment.

Pier No. 1 is continued as a shipping point from New York for freights for Philadelphia (Walnut street wharf), and for Camden and all points on the Camden & Amboy, Camden & Burlington County, Pemberton & Hightstown, Medford, Vincentown, Freehold & Jamesburg, Belvidere Delaware and West Jersey railroads, also for Baltimore, Washington and all points South, and for Pittsburgh and the West, *via* Pennsylvania and Baltimore & Ohio roads, and for local points on the Pennsylvania Railroad west of Mantua. Such freight is received and forwarded up to 6 P. M. Returning, the freight from the same points, except Philadelphia, arrives at Pier 1.

Freights are also received at Pier No. 16 up to 6 P. M. for all points between Jersey City and Mantua, including the Rocky Hill, Princeton and Holmesburg branches.

The addition of places of shipment is a great convenience and economy to shippers, saving, as it frequently does, cartage for long distances.

Thirty-six car-loads of strawberries were brought to New York over this road on the 4th inst.

Columbus, McArthur & Gallipolis.

This Ohio Company has its road under contract from Gallipolis, on the Ohio River, near the southeast extreme of the State, northwest to McArthur, about 35 miles, thence it is intended to extend it north 25 miles to Logan, on the Columbus & Hocking Valley road, by which it will have an outlet to Columbus and the Northwest. William Griffith, Jr., of Gallipolis, is President of the company.

New York, Westchester & Boston.

This company purposes the construction of a railroad nearly parallel with and for the most part quite close to the New York & Harlem and the New York & New Haven railroads, from the Harlem River, near Second avenue, to Port Chester, just at the Connecticut line. The company has issued a circular announcing that the directors have resolved that the fare on the road shall never be more than two cents per mile. Allan Hays is President; John Van Nest, Vice-President; James B. Hodgskin, Treasurer, and W. R. Bergholz, Chief Engineer. The company's office is at No. 20 Nassau street, New York.

Grand Trunk.

In statements made concerning the renewals of rails on this line we have made some mistakes, which should be corrected. The renewals for the second half of 1871 were 137¾ miles. For the entire year the renewals were 196¼ miles. The renewals of the main line were 20 per cent. for the year.

Ohio Railway.

A certificate of incorporation of the Ohio Railway Company was filed in the office of the Secretary of State at Columbus, O., May 31. The corporators are: E. T. Stickney, R. G. Rennington, W. H. Gibson, John T. Huss, Warren P. Noble, Thomas B. Tomb, R. W. Shawman, N. L. Brewer, J. M. Naylor, Luther A. Hall. The capital is to be $100,000, in shares of $50.

Northern New Hampshire.

At the recent annual meeting of this company the subject of leasing or contracting for the construction of the Concord & Rochester Railroad was referred to the board of directors with full power. At the meeting of the Concord & Rochester Company a committee was appointed to confer with the Northern Company in relation to the lease.

Little Rock & Fort Smith.

The track of this road is now completed for ten miles west of Lewisburg, long the terminus, and about 60 miles from Little Rock.

Sheboygan & Fond du Lac.

Trains now run through to Princeton, 15 miles west of Ripon.

Nashua & Lowell.

From the report presented at the recent annual meeting of this company, it appears that the receipts of the road during the past year were $557,862; expense of running the road and 10 per cent. dividend, $542,167; balance to contingent fund, $15,694. A lease of the Wilton Railroad for 20 years from April 1, at 7 per cent., free of tax, on the capital stock, was ratified, also a lease of the Peterborough Railroad for the same period. The Wilton Railroad lease has been also ratified by the stockholders of that company.

Athol & Enfield.

Springfield, Mass., has voted to subscribe $300,000 to the stock of this road, to secure its extension from Barrett's Station, in Belchertown, southwest to that city, about fifteen miles.

Lexington & Big Sandy.

Tracklaying on this road has progressed five miles beyond Winchester.

Danville & Paris.

One hundred car-loads of iron are expected at Danville, Ill., when track-laying will commence at this end of the road. Some ten miles of track have already been laid north of Paris.

May's Landing & Egg Harbor City.

This road from Egg Harbor City on the Camden & Atlantic, southward seven miles to May's Landing, has just been completed. It is leased to the Camden & Atlantic road, and was opened for business June 3.

Washington, Alexandria & Georgetown.

This road is reported sold to the Pennsylvania Railroad Company, (probably the Baltimore & Potomac is the purchaser,) and in a few days the cars will run to the new station at Sixth and B streets, making connection with the Baltimore & Potomac. The old depot on Maryland avenue is to be torn down. The old railroad bridge adjoining the Long Bridge, formerly used by this road, is also to be torn down.

Lake Ontario Shore.

The first rail on this road was laid at Oswego, May 27.

Indiana & Illinois Central.

This company filed for record with the County Recorder at Indianapolis, May 29, a mortgage to the New York Loan Fund and Trust Association to secure a loan of $3,500,000.

Mackinac & Chicago.

The Detroit *Tribune* says that the engineer party on the preliminary survey of this road is now at Kendall's, Van Buren County, working south. It has been determined that the work will be light and the road can be built at a small cost. The people at and south of Valparaiso say they will grade and bridge to Kankakee City on the Illinois Central, if the road can be ironed and operated.

Leavenworth, Lawrence & Galveston.

The Leavenworth *Times* says that the negotiations between this road and the Kansas Pacific, for the purchase of the Kansas Pacific branch from Lawrence to Leavenworth having failed, in consequence of the high price demanded for the branch road, surveys have been commenced for a new line between those cities. It is said that a new line can be built on a better route than that of the existing road.

New Hampton & Mankato.

The Dubuque *Herald* says that this is the name of a new company just organized in Chickasaw County, Iowa, having for its object the building of a railroad from a point some ten miles west of Fayette, on the line of the Iowa Pacific, northwest, through Chickasaw and Mitchell counties to Mankato, Minn. Local aid is promised in several towns.

Central of Iowa.

The St. Louis, Kansas City & Northern Railroad Company has offered to contribute $50,000 of the $100,000 which St. Louis was asked to furnish for the extension of this road from Albia to Moulton; $38,000 has been subscribed by private parties, leaving only $12,000 more to be raised.

Westchester & Philadelphia.

A recent act of the Pennsylvania Legislature allows the consolidation of the preferred and common stock of this road into one stock, provided the act is accepted by four-fifths of the stockholders. The consolidated stock was to be issued at the rate of one share for each share of the old common stock and three shares for every two shares of the old preferred stock. At a recent meeting in Philadelphia over 8,000 shares were voted—over three-fourths of the whole—and it is understood that more than enough have since accepted to make up the requisite four-fifths. The debt of the company has been consolidated and its business is rapidly increasing, and it is hoped that dividends are not very far off.

Central Pacific.

The Red Bluff *Independent* says that track is now laid to within three miles of Cottonwood Bridge, on the California & Oregon Branch. The bridge is nearly finished and the track is graded for four miles beyond the bridge.

San Francisco & Atlantic.

The executive committee of one hundred in San Francisco has adopted a plan for the organization of a company with the above name to build a road from San Francisco to the Colorado, under the laws of California, the capital stock to be $25,000,000, and the counties along the line are to be asked for subscriptions in proportion to their assessment rolls. This is intended to be the California end of the Atlantic & Pacific Railroad, should arrangements be made for the completion of that road.

Columbus Railroads.

Under the new law of Ohio, permitting under certain limitations municipal subscriptions in aid of railroads, many new projects are coming forward in Ohio, and many half dead schemes have been revived, with a good prospect of success. The Columbia *State Journal* notices several companies which purpose to construct lines to or through that place, among which are the Ohio & Kentucky, whose proposed line is from Columbus, southwestward to the Ohio, opposite Maysville, about 100

miles; the Columbus, the McArthur and Gallipolis, from Columbus southeast to the Ohio river at Gallipolis, also about 100 miles; the Scioto Valley, from Columbus due south to the Ohio at Portsmouth, by way of Circleville and Chillicothe, about 90 miles; and the Columbus & Toledo, from Columbus, a little west of north to Toledo, about 130 miles. Toledo is to vote July 1, on a proposition to subscribe $200,000 of its 8 per cent bonds in aid of the Columbus & Toledo road; a considerable force is at work on the Gallipolis road, near Gallipolis, and strong efforts are being made to have elections held for subscriptions in many places for the other roads, the general plan being to have municipal subscriptions sufficient to pay the cost of the road-bed ready for the rails, and then lease the property to the companies, to be ironed, to be equipped and operated.

Pennsylvania Petroleum Railroad.

The Erie *Observer* says that a large force is at work on the Erie end of this road, and considerable progress has been made in the grading. At the Titusville end of the road some eight hundred men are at work and have five or six miles graded, while another gang is at work at Cambridge. This road extends from Erie to Titusville, whence it will be extended through Enterprise and Pleasantville and will connect with the Pithole railroad. The road will be over 100 miles long, and it will be run in connection with the Atlantic & Great Western Railroad.

Atchison, Topeka & Santa Fe.

This company has closed a contract with Mr. S. T. Kelsey, granting him 30 sections of land from Hutchinson, Reno County, to the west line of the State, for the purpose of experimenting in the planting of trees. Beyond Hutchinson, on the north line of the road, there is little or no timber; and while the land is said to be good, the absence of all timber renders it undesirable for farming purposes. Mr. Kelsey will break ground next fall, and begin planting early in the spring.

Cincinnati, Richmond & Fort Wayne.

A dispatch from Fort Wayne, Ind., says: "The question as to who shall control the Cincinnati, Richmond & Fort Wayne Railroad is still unsettled. A proposition is before our City Council looking toward a compromise between the disaffected stockholders and the lessees of the road. It was proposed that if the lessees build shops at this point, of certain dimensions, as was contemplated when the city subscribed its stock to the road, said stock should be voted in favor of ratifying the lease. After a spirited discussion the proposition was rejected by the casting vote of the Mayor."

Northern Pacific.

A correspondent writing from Helena, Montana, under date of May 25, says:

"The Montana Division has been formed, and three parties are out in the field completing the surveys of last summer. These parties are composed as follows:

"Party No. 1.—James Bettner, of New York, Assistant Engineer; Colonel L. Martin, of Wisconsin, Transitman; A. O. Lambert, of New York, Topographer; J. D. Chenoweth, of Washington, Leveler.

"Party No. 2.—M. T. Burgess, of Corinne, Utah, Assistant Engineer; Michael A. A. Meyendorff, of New York, Transitman; William Eliot Wilson, of St. Louis, Topographer; T. N. McKennan, of Washington.

"Party No. 3.—Colonel W. W. De Lacy, of Montana, Assistant Engineer; C. Billop, of New York, Transitman; N. Wilkie, of Montana, Topographer; P. Gibson, of Montana, Leveler.

"Party No. 1 begins from Missoula City (point through which passed the lines surveyed last summer) through Coriacan Defile, down Joca Valley and Clark's Fork to Pend d'Oreille Lake.

"Party No. 2 begins at the mouth of Divide Creek, which heads into the Deer Lodge Pass surveyed last summer, follows up the Wisdom at Big Hole Rivers to the sources in the Rocky Mountains, namely, the branch of Rocky Mountain known as Bitter Root Range. Then descending with *some* stream the Pacific Slope down to Salmon City, Wash. Ter.

"Party No. 3 begins at Salmon City, goes down Salmon River, then follows down Snake River to Lewiston.

"Captain Eastwick, of the Pacific Division (T. B. Morris, Division Engineer) will locate from Snake River to Pend d'Oreille Lake.

"The Yellowstone parties have not been formed as yet. A party in charge of Thomas Roberts (son of the Engineer-in-Chief) is making an exploration of the Missouri River from Sioux City, Iowa, to Benton City, Montana, the head of navigation.

"General Rosser, Division Engineer of Dakota Division, has located about 100 miles west of Red River. Colonel W. Milnor Roberts is Engineer-in-Chief, and C. D. Linsley Chief Assistant Engineer."

Western Union.

It is said that the Milwaukee & St. Paul Company contemplate the extension of this road from Beloit, Wis., southward through Rockford to the rich coal and corn regions of Illinois. This would be very nearly on the line of the proposed Rockford Central road.

Muscatine Western.

The Burlington *Hawkeye* says that the Burlington, Cedar Rapids & Minnesota Railroad Company have obtained the franchises, local aid, and work already done on this road, and have agreed to have the iron laid on that part of the road between Muscatine and the Iowa river (about 20 miles) within 30 days. The effect of this would be to give the Burlington company an outlet at Muscatine as well as at Burlington.

Atlantic & Pacific.

The route of this road through New Mexico has been filed in the Register's office at Santa Fe. The *New Mexican* says that the road enters the territory on the eastern boundary in township 14 north range 37 east, on the Canadian or Red River, thence up Red River to the mouth of the Concha, whence it bears westerly, crossing the Pecos River near Antonchico, through the Beck grant and the southern portion of Eaton's grant, striking the Galisteo River in township 12, and following that stream to the Rio Grande near Santo Domingo. From here it runs down on the east bank of the Rio Grande to a point opposite Isleta where it crosses the river and thence takes a southwest course to the Rio Puerco, crossing it about west of Valencia and thence running northwesterly passing near Lagana, Rito, Cubero and old Fort Wingate to the new post of Wingate and thence takes a southwest course to the western boundary of the territory.

Annual Meetings.

Milwaukee & St. Paul Railway Company at Milwaukee, June 8. Transfer books reopen June 24.

Broadway & Seventh Avenue (street) Railroad Company in New York, June 10. Transfer books reopen June 11.

South Side of Long Island June 11. Books reopen the same day.

Michigan Air Line.

A Cassopolis correspondent of the Detroit *Tribune* says that a meeting of the stockholders of this company was held at Cassopolis, May 28, "for the purpose of considering the difference existing between themselves and the 'Michigan Central Railroad Company,' growing out of the lease by virtue of which the Central Company are now running the Air Line road between Jackson and Niles. Stockholders were present from nearly every town along the line of the road to the number of about 100, with J. N. Westcott, of Homer, chairman. From the statement of the chair to the meeting it seems that the Michigan Central Railroad Company hold the Air Line division under a lease for 999 years, executed by Jerome B. Eaton, President, and O. W. Bennett, Secretary of the Air Line Company. This lease, the stockholders of the Air Line Company assert, is void on account of its having been executed without the authority of the Board of Directors, and through fraud, and the forgery of the Secretary's name, who is now dead. A majority of the Board of Directors assert that they supposed the lease was for only five years, and knew nothing to the contrary until nearly a year after its execution. The Air Line Company has a floating debt of nearly $60,000, and as the lease for 999 years is a virtual sale of the road, and all the consideration received for the lease went upon the road, the company is insolvent and the stockholders are liable for its debts. The object of the meeting held yesterday was to devise some means to release the stockholders from liability for the company's debts, and, if possible, to realize something from their stock. They seem to have no objection to the road remaining in the present hands, and the lease ratified, providing they can be saved harmless from liability and receive a little something for their stock. A committee of three—consisting of Joseph Smith, of Cassopolis, J. N. Westcott, of Homer, and William Allison, of Centerville—were appointed with authority to negotiate with Mr. Joy, of the Central road, and, if possible, obtain an amicable settlement of differences. A committee of three from each village along the line of the road was appointed to raise money to carry out the purposes of the meeting. Hon. Eugene Pringle, of Jackson, one of the present directors, and G. M. Mason, of Centerville, attorney of the road, were present and dissuaded the commencing of any legal proceedings. They showed by facts and figures the inexpediency of any proceedings in the courts to vitiate the lease, showing that if the lease were pronounced invalid and set aside, that the Central Company must be paid something over $2,000,000."

Report of the Mobile & Ohio Railroad.

The Mobile & Ohio Railroad comprises a main line from Mobile northward to the Mississippi River at Columbus, Ky. (20 miles below Cairo), a distance of 472 miles, with a branch from Narkeeta, Miss., 163 miles north of Mobile, northeast to Gainesville, Ala., 22 miles; one from Artesia, 219 miles from Mobile, northeast 14 miles to Columbus, Miss.; and one from Muldon, 240 miles from Mobile, northeast 10 miles to Aberdeen, Miss. The total operated is 518 miles.

The annual report for the year 1871 shows gross earnings, $2,739,448.68; expenditures, $1,894,167.86; net receipts, $845,280.82. Of the expenditures $119,202.37 are reported to have been for permanent improvements and additions to the company's property, which would make the working expenses proper about 65 per cent. The increase in receipts was a little more than $180,000, or about 7 per cent., compared with those of 1870, and would have been much greater, it is reported, if the Alabama & Chattanooga Railroad had not suspended operations just as it was likely to bring the Mobile & Ohio a very considerable through traffic; if the competition between Mobile and New Orleans had not been so great as to virtually give the former place the advantage of river rates from the northern points from which the Mobile & Ohio obtains most of its through southward business; and if a remarkable freshet had not prevented the operation of the road for ten days in May.

The President reports that the company has resumed payment of the interest on its second-mortgage bonds, has paid the debt due the state of Tennessee by an issue of its own bonds and has negotiated with the "Kentucky & Tennessee Railroad Company" for the construction by that company and the lease to the Mobile & Ohio of an extension to Cairo.

The capital stock amounts to $4,428,036.34; the bonded debt to $10,760,674.07, the capital account per mile being thus at the rate of only $20,775 per mile of road—one of the lightest in America.

From the report of the Chief Engineer and General Superintendent, Mr. L. J. Fleming, we take the following:

Auditor's tables Nos. 1 and 2 give the earnings and expenses, which compared with the previous year are as follows:

Earnings.	1870.	1871.
From passengers	$ 695,234 16	$ 681,460 92
From mail	49,294 47	49,090 00
From express	54,750 00	54,750 00
From freight	1,760,073 20	1,954,317 76
Total	$2,559,340 93	$2,739,448 68
And the expenses	1870.	1871.
Repairs of roadway	$ 595,509 32	$ 562,326 10
Repairs of machinery	449,326 10	512,779 4
Conducting transportation	965,169 23	799,062 28
Totals	$1,910,008 65	$1,894,167 86
Net earnings	$ 649,231 67	$ 845,280 82

There is a decrease in the earnings of the passenger trains of $14,037.71, and an increase in the freight of $194,143.47.

There were 15,792,459 passengers moved one mile, and the average distance traveled by each passenger was 41 miles.

The number of bales of cotton moved was 182,854, against 225,165 the previous year. There was a decrease in the receipts at Mobile of 11,076 bales, and in shipments northward of 17,447 bales.

The mileage of engines was as follows:

Passengers	801,122
Freight	488,080
Gravel and construction	218,046
Switching	52,575
Total	1,432,823

The earnings per mile of road compared with previous years are—

	1868.	1869.	1870.	1871.
From passengers	$1,124	$1,206	$1,131 15	$1 320
From freight	2,437	2,760	3,410 99	3,4 5
From mail and express	258	244	2 1 05	201
Total	$3,509	$4,370	$4,746 19	$5,006

The earnings per train, mile:

	1868.	1869.	1871.
Passenger trains	$1 77	$1 66	$1 49
Freight trains	2 22	2 87	3 16
All trains	2 03	2 00	2 12

In the expenditures of the year under the head of "Improvement—New Work," there is included $30,260.48 in the roadway department for the construction of the passenger building at Mobile, filling up station grounds and other necessary improvements on the road. In the machinery department there is $88,941.39 charged to the same account, for the construction of new passenger, freight, express and baggage cars. These items have heretofore been charged to construction and should be deducted from the expense account to make a fair comparison with previous years.

TONNAGE MOVEMENT.

There were 46,006,987 tons moved one mile during the year, being an increase over the previous year of 10,920,227 tons, or about 30 per cent. Dividing the items of expenditure which are common to freight and passenger in proportion to earnings, and the cost of moving freight, will be three one-tenth cents per ton per mile. Leaving out of the expenses all items not influenced by the *weight*, *number* or *speed* of the trains it will be found that an additional amount of 46,006,987 tons could have been moved at 1 78-100 cents per ton per mile.

The receipts from passengers since 1867 have increased $113,824.70, or about 17 per cent., while the increase from freight has been in the same time nearly 70 per cent. The reports show that one-third of the freight cars run empty, and that the average load of all cars moved was 4,500 pounds, while the actual capacity is from sixteen to eighteen thousand pounds.

The freight being therefore the most important branch of the business, and developing more rapidly than any other, the necessary rolling stock should be obtained, and arrangements made to remove it promptly.

ROLLING STOCK.

The condition of the rolling stock has been improved during the year. The locomotives are generally in better order than at any time since the war. One hundred and eleven new freight cars, four six-wheeled passenger, two express and one baggage car have been added to the stock during the year. All of these, except the bodies of two passenger cars purchased in Cleveland, were constructed at Whistler and Jackson shops. There is on hand the iron work, except wheels and axles, for ninety freight cars and one baggage; and two express cars are approaching completion. The opinion before expressed as to the superior character of the plans and workmanship of the cars, both freight and passenger, constructed in the company's shops, has been fully confirmed by the experience of the past year.

ROADWAY.

The track has stood the winter better than usual. This is due, in some measure, to the ballasting in the prairies, the removal of laminated rails and the unusual dry weather. The rails referred to in the last report have been laid down, and 2,000 additional tons have been purchased, and at the date of this report, about one half of them has been laid down. Included in the repair of road is $19,406.52 extraordinary expenses, produced by the freshet of last May. This freshet, in the Chickasawha and its tributaries, was four and a half feet higher than the traditional high-water marks, and prevented the running of trains through for ten days. The past year has been marked by extraordinary floods over the whole country.

KENTUCKY & TENNESSEE RAILROAD.

A survey for this road, extending from Columbus to Cairo, was made under the joint direction of the Illinois Central Railroad and this company. Two lines were run, the first leaving the main line four and a half miles south of Columbus, and the other passing through the town. Other instrumental examinations are now being made, preparatory to making the final location. The early construction of this road is rendered important by the speedy construction of the Cairo & Vincennes road, and the Short Line from Cairo to St. Louis. These roads will concentrate a large traffic at Cairo, which will force a southern connection by rail, and the Mobile & Ohio Railroad should be the first to make it.

THROUGH BUSINESS.

The completion of the New Orleans, Mobile & Texas Railroad to New Orleans gives this company the opportunity to compete for through northern and western business. Until the extension of the Mobile & Montgomery road to this city, close connections were made with that road, and a large part of the through travel came by this route. On the completion of that road, however, the connections were broken, and travel has gone by other routes. This company must, therefore, decide upon relying entirely upon its local business, or to run a double daily passenger train, and at a higher rate of speed than heretofore. The improved condition of the track will justify this, but it will require five engines, three passenger and three additional baggage cars.

A careful review of the earnings and expenses since the war, shows a steady and gratifying increase in the former, and a great improvement in the condition of the company's property. The fact is now fully established, if ever there was any doubt upon the subject, that the local business is sufficient to pay the interest on its indebtedness, and to leave a margin for the purchase of additional rolling stock necessary to meet the increased business. Notwithstanding the very short crop of the past year, and the expenditure of $138,608 for new cars, depots, etc., the loss of business from an extraordinary freshet and the cost of repairing the damage, the net earnings are more than sufficient to pay the interest on the bonded indebtedness.

The trains have been run with marked regularity and freedom from serious accidents, and I close this report with the stereotyped phrase "that no passenger has been killed or seriously injured during the year." The officers and employees of the company have faithfully discharged their duties, and merit the thanks of the company.